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P.R.S.

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by Jerome

(written) during military service (1617-21) For Prince

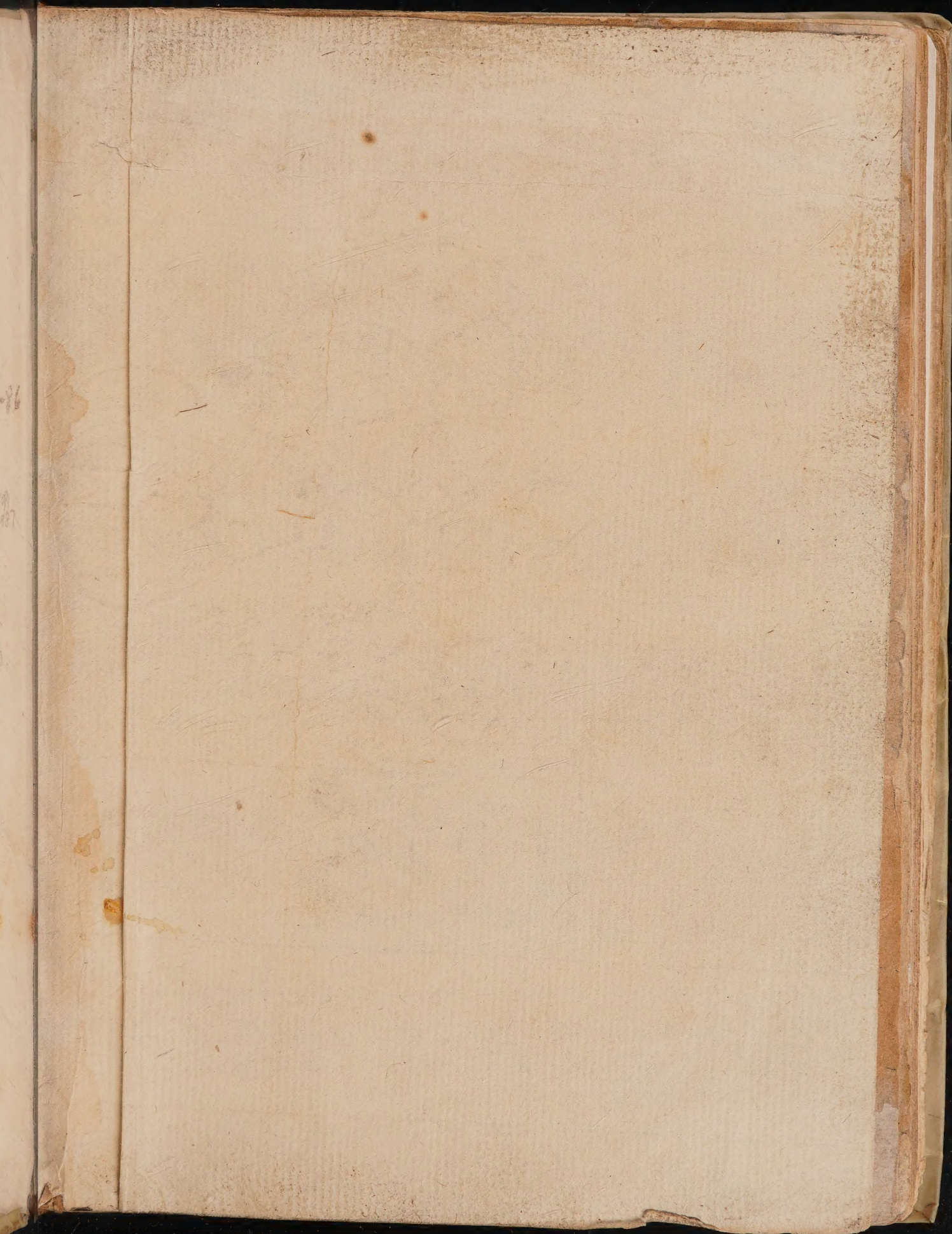
Maurice & Oran. Gt to know Isaac Beeckman, of Dort. MS.  
entrusted to Beeckman. Published after D's death in 1650.  
Immediately preceded the period in "an Oran".

It might be the first thing he wrote.  
He had already, before 1612, met Mersenne.  
Mersenne & he were schoolfellows at Jesuits Coll  
L'Harmoise Universelle written 1636

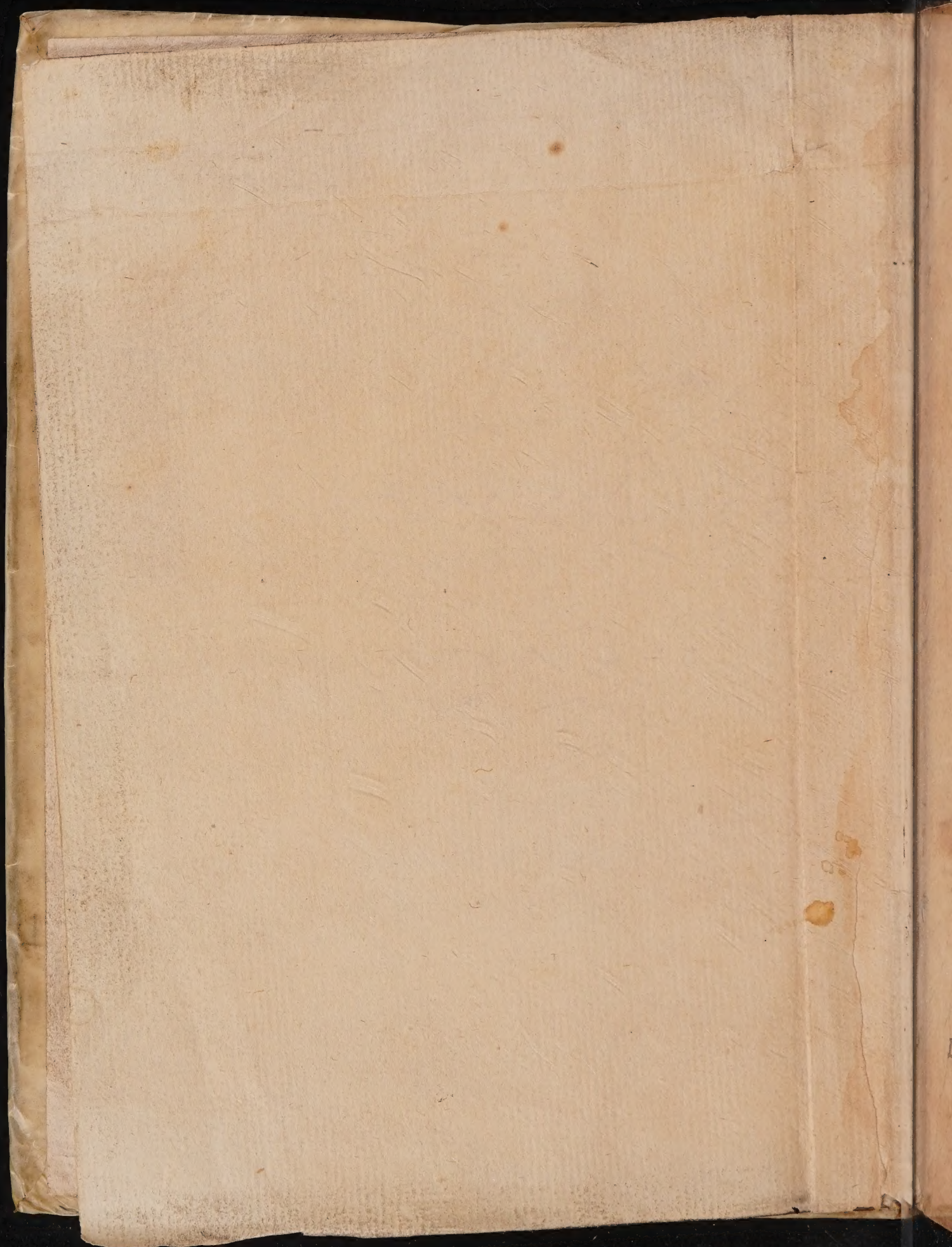
p64. Ref Mersenne, Kircher, Morley

M. Kircher  
early Dec











RENATUS DESCARTES  
EXCELLENT  
COMPENDIUM  
O F  
MUSICK:  
WITH  
*Necessary and Judicious*  
ANIMADVERSIONS  
Thereupon.

---

*By a Person of HONOUR.*

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*London, Printed by Thomas Harper, for Humphrey Moseley,  
and are to bee sold at his Shop at the Signe of the  
Princes Armes in S. Pauls Church-Yard, and  
by Thomas Heath in Coven Garden. 1653.*



349760

ANIMAL ADVANTAGES  
NECESSARY AND  
MILK  
COMPENDIUM  
EXCELLENT  
REMARKS ON



By a Person of 110

1. The first of the following is a list of the names of the authors of the works mentioned in the preceding list. The second is a list of the titles of the works. The third is a list of the years in which the works were published. The fourth is a list of the places where the works were published. The fifth is a list of the names of the publishers. The sixth is a list of the names of the booksellers. The seventh is a list of the names of the libraries. The eighth is a list of the names of the collectors. The ninth is a list of the names of the owners. The tenth is a list of the names of the donors. The eleventh is a list of the names of the recipients. The twelfth is a list of the names of the donors. The thirteenth is a list of the names of the recipients. The fourteenth is a list of the names of the donors. The fifteenth is a list of the names of the recipients.





THE  
STATIONER

*To the Ingenious*

READER,

*&c.*

SIR:

**N** O sooner can your Eye have  
taken in the Title of this  
thin Volume, which I have,  
in some latitude of Assistance,  
Midwiv'd into this our  
English World; but you shall most willing-  
ly



## The Stationer

ly confesse it to be as well a sufficient Justification to my Industry and Cost, as a full Elogie to it selfe: The *AUTHOR* thereof, being one of the fairest Flowers in that Garland of the Mathematicks, wherewith this Century being meritoriously adorned, may, without breach of Modesty, take the right hand of Antiquity, and stand as well the Wonder, as Envy of Posterity: and so gratefully acknowledged by all, whose Studies and Ingenuity have qualified them with Judgement enough to profound the sense of his Geometry and Algebra. And its *SUBJECT* so universally Gratefull; that I dare say, you have not, in all your Readings, met with the Name of any Person, except onely Tacitus the Emperour, who was so rude and harsh of Disposition, as to dislike the Melody of Numbers.

Concerning the *AUTHOR*, therefore,  
the



to the Reader.

*the most your selfe can judge me fit to say, is only this ; that the most becoming Tribute I can pay unto his Noble Memory, is a silent Veneration: it being almost of Necessity, that a Panegyrick on Him from my unequal Pen, be interpreted a kind of implicate Diminution ; since it must suppose the Height of His Merit to be commensurable by the Digits of so slender a Capacity ; and few will admit Him for a Competent Doxologist, who is, by incomputable distances, below a due Apprehension of the Excellences of his Subject.*

*And, as for the SUBJECT likewise, wherewith the Rationall Soule of Man is so Pathetically , and by a kinde of occult Magnetisme, Affected , that even the most Rigid and Barbarous have ever Confest it to be the most potent Charme either to Excite, or Compose the most vehement Passi-*



## The Stationer

ons thereof ; as Homer ingeniously intimates in his *Figment* , that it was the Custom of the Gods , to pacifie their Civil Dissentions with the Harmony of Musick , and that the Rough spirited Achilles, with the soft Concordant Echoes of his owne Harp , used to Calme the tumultuous estimation of his Choler ; and as all Poets unanimously intend, in that they have made the Magick of Sirens to consist only in the sweet Accents and Melotheticall Modulation of their Voices : Concerning this, I say , it would sound a mere Pleonasm for me, here, to Commend it by any other Argument, but this unfrequent one. That the Sage and Upright Ancients had Musick in so high Estimation, as that, when they would fully Characterise a Learned and Sapient Person, they called him only *ῥη μῦσικόν*, a Musician : and, if his long Study of Humanity

ty



to the Reader.

ty and the Liberall Sciences had raised Him to Eminency; they onely went two Notes higher, and in the superlative degree styled Him *μεσινώτατον*, as if to be well skilled in the Concordant and Discordant Proportions of Numbers, were the most perfect Diapason of Virtue and Knowledge. Thus much, besides the expresse Records of Plutarch and Diogenes Laertius, may be naturally inferred from hence; that even the best of our Moderne Grammarians, and Philologers derive the word Musick, as also the Muses, from the Greeke Verbe, *μᾶω*, that signifies to Explore with desire: and this, upon no slender Reason; inso-much as the Key that opens the difficult Locks of all Arts and Sciences, must be an ardent Desire of Disquisition. The same also may bee easily Collected from this Consideration; that to a Complete Musitian

(please



## The Stationer

(please you, to understand Him to be such, as hath not only Nibbled at, but swallowed the whole Theory of Musick; i. e. having profoundly speculated the Pythagorean Scheme of the various Sounds arising from various Hammers, beaten on an Anvill, respective to their different Weights, doth clearly and distinctly understand as well the Arithmetical, as Geometrical Proportions of Consonances, and Dissonances: for, it is not the mere Practical Organist, that can deserve that Noble Attribute) is required a more then superficial insight into all kinds of Humane Learning. For, He must be a Physiologist; that He may demonstrate the Creation, Nature, Proprieties, and Effects of a Natural Sound. A Philologer, to inquire into the first Invention, Institution, and succeeding Propagation of an Artificial Sound, or Musick. An Arithme-



to the Reader.

Arithmetician, to be able to *explaine the Causes of Motions Harmonical*, by Numbers, and declare the *Mysteries of the new Algebraical Musick*. A Geometrician; to *evince, in great variety, the Original of Intervalls Consono-dissonant*, by the Geometrical, Algebraical, Mechanical Division of a Monochord. A Poet; to conform *his Thoughts, and Words to the Lawes of præcise Numbers*, and distinguish the *Euphonie of Vowells and Syllables*. A Mechanique; to know the exquisite *Structure or Fabrick of all Musical Instruments, Winde, Stringed, or Tympanous aliàs Pulsatile*. A Metallist; to explore the different *Contemperations of Barytonous and Oxytonous, or Grave and Acute toned Metalls*, in order to the *Casting of tuneable Bells, for Chimes, &c.* An Anatomist; to *satisfie concerning the Manner, and Or-*  
b  
gans



## The Stationer

gans of the Sense of Hearing. A Melothetick; to lay down a demonstrative method for the Composing, or Setting of all Tunes, and Ayres. And, lastly, He must be so far a Magician, as to excite Wonder, with reducing into Practice the Thaumaturgical, or admirable Secrets of Musick: I meane, the Sympathies and Antipathies betwixt Conounds and Disounds; the Medico-magical Virtues of Harmonious Notes (instanced in the Cure of Sauls Melancholy fits, and of the prodigious Venome of the Tarantula, &c.) the Creation of Echoes, whether Monophone, or Polyphone, i. e. single or Multiplied, together with the Figures of Buildings, and arched Rocks, neer Rivers, Dales, or Woods, requisite to the multiplied Reverberations of Sounds; the Artifice of Otoconstick Tubes, or Auricular Meanders,  
for



to the Reader.

for the strengthning, continuation, and remote transvection of weak sounds, and the mitigation of strong; the Model of Auto-phonus, or speaking Statues; and, finally, the Cryptological Musick, whereby the secret Conceptions of the mind may be, by the Language of inarticulate Sounds, communicated to a Friend, at good distance.

These Considerations premised; All that can remain to me, as the proper Argument of this Præface, is to advertise you, in a word, (1) That the many and grosse Defects observed in the Latine Impression, especially in the Figures, and Diagramms, wherein the Evidence of each respective Demonstration ought to have consisted; was a principal Occasion to this my English one: which I may justly affirme to be so Accurate, some few Litteral Oversights of the Press only excepted, that the Excellent



## The Stationer

Des-Cartes, had He lived to see it, would have acknowledged the Translator for a greater Friend to his Honour, than that raven Disciple of his, who having unfaithfully transcribed the Original, and divulged his owne faulty Copy; hath often given occasion not only to the Enemies, but also some of the Defendants of his Masters Learned Industry, to suppose, that in this particular Treatise, He write some things more then Himself clearly understood. And (2) that the Authour of the concise, but weighty **ANIMADVERSIONS** subsequent, long labouring his Thoughts in the strict Examination of the Apodictical Verity of Des-Cartes, Fundamentals, in this Compendium; most happily lighted on the Discovery of a New Hypothesis, demonstratively sufficient to the full and easie Solution of all the Phœnomena in Musick:



to the Reader.

*a Summary whereof, I doe bere, as well to prepare, as endear your Attention, present you.*

*All Consonances, and other Musical Intervalls doe arise*

*According to Des-Cartes Principles, from an Arithmetical Division of the Chord, i.e. by Dichotomising the space of an Eighth, &c. as an Eighth from a Bipartition of the whole Line.*

*According to others, and the most Judicious Writers on this Subject (such are Mersennus, Lib. de Instrum. Harmonic. i. propos. 15<sup>a</sup> & Kircherus, in Artis magn. Consoni & Dissoni Lib. 4.) from the Division of an Eighth Geometrically, i. e. into twelve equal Semitones, by eleven meane Proportionals.*

*But, according to the New Supposition excogitated by the profound Authour of*  
b 3 *these*



## The Stationer

*these Animadversions; from the Division of the whole Chord into Extreame and Mean Ration, and of the Mean Ration, according to this Analogie, Viz.*

*As the Number of Parts in the First Terme,*

*to the Number of Parts in the Third:*

*So the Number of Rations between the First and Second,*

*to the Number of Rations between the Second and Third.*

*Which Novell Invention alone, is more then enough, on the one side, to give the Capable part of Scholers a gratefull Relish of the Inventors extraordinary Abilities in the Noblest Member, or Heart of Learning the Mathematicks: so also, on the other, to promise an advantageous Compensation of so small an expence of Oyle, as is required*

*to*



to the Reader.

to the comprehensive perusal (not to take  
notice of the contemptible Price) of these  
few Sheets. In the Confidence whereof, it  
is fit I surrender you to the pleasant Lecture  
and Enjoyment of the Book it self.

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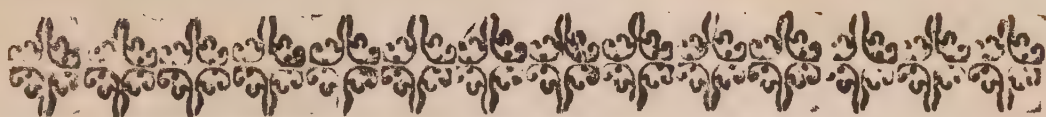


17th of July

Received of the Honble the  
Governor of the Colony of New South  
Wales the sum of £1000  
being the balance of the  
Account of the  
Revenue of the Colony of New South  
Wales for the year 1791

£1000





## *A Compendium of Musick.*

### CHAPTER I.



He *OBJECT* of this Art is a Sound.

The *END*; to delight, and move various Affections in us. For Songs may bee made dolefull and delightfull at once : nor is it strange that two divers effects should result from this one cause, since thus Elegiographers and Tragoedians please their Auditors so much the more, by how much the more grieve they excite in them.

The *MEANS* conducing to this End, or the Affections of a Sound are chiefly two; *viz.* the Differences therof in the reason of Duration or Time, and in the reason of its intension or modification into Acute or Grave; for concerning the quality of a Sound, from what body and how it may procede more gratefull, is the Argument of Physiologists.

This only thing seems to render the voice of Man the most gratefull of all other sounds; that it holds the greatest conformity to our spirits. Thus also is the voice of a Friend more gratefull then of an Enemy, from a sympathy and dispathy of Affections: by the same reason, perhaps, that it is conceived that a Drum headed with a Sheeps skin yeelds no sound, though stricken,

A

if



if another Drum headed with a Wolfs skin bee beaten upon in the same Room.

## CHAP. II.

### *Præconsiderables.*

1. Each Sense is capable of some Delectation.

**E** 2. To this Delectation is required a certain proportion of the object to the sense. Hence comes it, (for instance) that the noise of Thunder, and the report of Guns are not convenient to Musick : because they offend the Ear, as the too great splendor of the Sun doth destroy the sight.




3. The Object must bee such, as that it fall not upon the Sense with too great Difficulty and Confusion. Hence comes it, (for instance) that any Figure exceedingly implicate, though exactly regular, such is the Mother in the Astrolabe, is not so pleasant to the Aspect, as another consisting of lines more equall ; such as is in the same Net : the reason wherof is, because the sense doth more fully satisfie it self in the one, then in the other, wherein are many things which it doth not perceive sufficiently distinct.



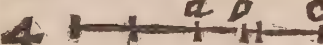
[1] 4. That Object is more easily perceived by the sense, in which is found the least Difference [1] of Parts.

[2] 5. The parts of an Object are said to bee lesse different each from other, when they mutually hold the greater proportion [2] each to other.

6. That proportion ought to be *Arithmetically*, not Geometricall. The reason wherof is, because, in that, there



there are not so many things advertible, since the Differences are every where equall : and therefore the sense suffers not so much labour and defatigation, that it may distinctly perceive all things occurring therein [3]: For 2  [3] example, the proportion of these lines 3  is more easily distinguished by the eies, 4  then of these

 [4]  [4]  because in the

first, the sense is required only to advert the Unity for the difference of each line ; but in the second, the parts AB, and BC, which are incommensurable. And therefore, I conceive, they can by no means be perfectly perceived by the sense, together and at once, but only in order to a proportion *Arithmetical* ; so that it may advert in the part AB two parts, [5] wherof three [6] are existent in BC ; wherin it is manifest, that the sense is perpetually deceived. [5] [6]

7. Among Objects of the sense, that is not most gratefull to the Mind, which is most easily perceived by the sense ; nor that, on the contrary, which is with the most difficulty apprehended: but that which is perceived not so easily, as that that naturall desire, wherby the senses are carried towards their proper Objects, is not therby totally fulfilled ; nor yet so hardly, as that the sense is therby tired.

8. Finally, it is to be observed, that *Variety*, is most gratefull in all things. These Propositions conceded, let us consider the first *Affection* of a Sound.





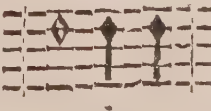

## C H A P. III.

*Of Number, or Time to be observed in Sounds.*

**T**ime, in Sounds, ought to consist of equall Parts ; because such are the most easily of all others perceived by the sence, (according to the fourth Præconsiderable:) or of Parts which are in a double or triple proportion, nor is there any further progression allowable ; because such are of all others the most easily distinguished by the ear, (according to the fifth and sixth Præconsiderables. ) For, if the measures were more unequall, the Hearing could not apprehend their differences without labour and trouble, as experience witnesseth: For, if against one note we should place (for instance) five equall ones; it could not be sung without extream difficulty.

You object, that four Notes may be placed against one, or eight ; and therefore a farther progression may be made to these Numbers. We answer, that these Numbers are not the first among themselves, and therefore doe not generate new proportions ; but only multiply a double : which is constant from hence, that they cannot be set unlesse combined, nor can we set such

[7] Notes [7] alone,  where the second is the fourth part of the  first :

But thus,  where the last seconds are the half part  of the first, and so there is only a double proportion multiplied.

From these two kinds of proportions in Time, there arise



arise two kinds of Measures in Musick: namely by a Division into Three in time, or into Two. But, this Division is noted by a percussion, or stroke, as they call it; which is ordained to assist our Imagination, that so we may the more easily perceive all the members of the Tune, and be delighted with the proportion, which ought to be in them. Now, this proportion is most frequently kept in the members of the Tune, in order to the helping of our Imagination, so that while we yet heare the last of the time, we may remember what was in the first, and what was in the rest of the Tune. Which is effected, if the whole Tune be composed of 8, or 16, or 32, or 64, &c. members: so that all Divisions may proceed from a double proportion. For then, when we have heard the Two first members, we apprehend them as one, while yet wee conjoyne the Third member with the First, so that the proportion becomes triple: afterward, when we have heard the Fourth, we conjoyn it with the Third, and so apprehend it as one and the same. Then we again conjoyn the Two First with the Two Last, and so apprehend those Four together as One. And thus doth our Imagination proceed even to the end: where at length it conceives the whole Tune, as one intire thing composed of many equall members.

Few have understood, how this Measure can be exhibited to the ears without a percussion, or stroke, in Musick, very diminute and of many voyces. This we say is effected only by a certain intension of the *Spirit* or breath, in *Vocall* Musick; or of the *Touch*, in *Instrumental*: so as from the beginning of each stroke, the sound is emitted more distinctly. Which all Singers naturally observe, and those who play on Instruments; principally



pally in Tunes, at whose numbers we are wont to dance and leap: for, this Rule is there kept, that we may distinguish every stroke of the Musick, with a single motion of our bodies; to the doing of which we are also naturally impelled by Musick. For certain it is, that a sound doth concusse, or shake all circumjacent bodies, as is exemplified in *Thunder*, and the ringing of *Bells*; the reason whereof is to be referred to the disquisition of *Physiology*. But, insomuch as the *Hoti* is confest by all men, and that the sound is emitted more strongly, and distinctly in the beginning of each Measure, as we have formerly hinted: we may well affirm, that that sound doth more smartly and violently concusse or agitate our Spirits, by which we are excited to motion; as also by consequence, that *Beasts* may dance to number, or keep time with their Feet, if they be taught and accustomed thereto; because to this, nothing more is required, then only a mere naturall *Impetus*, or pleasant violence.

Now, concerning those various Affections, or Passions, which Musick, by its various Measures can excite in us; we say, in the Generall, that a slow measure doth excite in us gentle, and sluggish motions, such as a kind of Languor, Sadnesse, Fear, Pride, and other heavy, and dull Passions: and a more nimble and swift measure doth, proportionately, excite more nimble and sprightly Passions, such as Joy, Anger, Courage, &c. The same may be also sayd of the double kind of percussion, viz. that a *Quadrate*, or such as is perpetually resolved into equals, is slower and duller, then a *Tertiate*, or such as doth consist of Three equal parts. The reason whereof is, because this doth more possesse and imploy the sence, inasmuch as therein are more (namely 3) members to be



be adverted, while in the other are only 2. but a more exact & ample disquisition of this rare secret, doth depend upon the exquisite cognition of the *Motions* of the *Minde*; of which this place is incapable.

However, we shall not omit, that so great is the force of *Time* in Musick, as that it alone can of it selfe adfer a certain *Delectation*; as is experimented in that Military Instrument, the *Drum*, wherein nothing else is required then meerly measure of *Time*; which therefore (I conceive) cannot there be composed of only 2, or 3 Parts, but also of 5, or perhaps 7 others. For since in such an Instrument the sence hath nothing else to take notice of, but bare *Time*: therefore in *Time* may be the greater *Diversity*, that so it may the more exercise and imploy the sence.

## C H A P. I V.

*Of the Diversity of Sounds, concerning Acute and Grave.*

**T**HIS may be considered chiefly in three manners, or wayes; either in sounds which are emitted at once and together from divers bodies; or in those which are emitted successively from the same voyce; or lastly, in those which are emitted successively from divers voyces, or sonorous bodies. From the first manner, arise *Consonancies*: from the second, *Degrees*: from the third, *Dissonancies*, which come nearer to *Consonancies*. Where it is manifest that in *Consonancies* the *Diversity* of Sounds ought to be lesse, than in *Degrees*; because that would more tire, and disgust the Hearing



in sounds, which are together emitted, then in those that are emitted successively. The same also, in proportion, may be affirmed concerning the Difference of Degrees from such Dissonancies, as are tolerated in relation.

## C H A P. V.

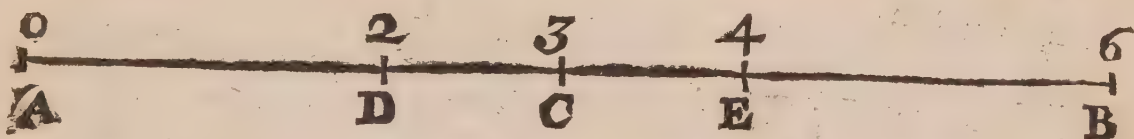
### *Of Consonancies.*

**F**irst, we are to observe, that an Unison is no Consonance ; because therein is no Difference of Sounds, as to Acute and Grave : but that it bears the same relation to Consonances , that Unity doth to Numbers.

Secondly, that of two Terms, required in Consonances, that which is the more Grave, is far the more Potent , and doth in a manner contain the other Term in it selfe : as is manifest in the Nerves of a Lute, of which when any one is percussed, those strings, which are an Eighth, or Fifth more acute [8], tremble and resound of their own accord ; but those which are more Grave do not, at least do not appear to the sense so to do ; the Reason whereof is thus demonstrated. *One sound bears the same respect to another sound , that one string bears to another string :* but in every string that is greater, all the other strings, that are lesse, are comprehended ; though every string that is longer, doth not comprehend all the others, that are shorter : and therefore also in every Graver Sound , all others more Acute are comprehended ; but not, on the contrary , in every Acuter Sound are the more Grave comprehended : whence it is evident, that the



the more Acute Termis to be found by the Division of the more Grave. Which Division that it ought to be Arithmetically, *i. e.* into equall parts, is consequent from what was before observed in the sixth Præcon- siderable.



Let, therefore,  $AB$  be the more Grave Term, in which if I would find the Acuter Term of all the first Consonances, I must divide it by the first of all Numbers, *viz.* by 2, as is done in  $C$ ; and then  $AC$ ,  $AB$ , are distant each from other, the first of all the Consonances, which is called an Eighth and Diapason. Further, would I have other Consonances, which immediately follow the first; I must divide  $AB$  into three equall parts; and then I shall have not only one Acute Term, but two, *viz.*  $AD$ , and  $AE$ , from which there will arise two Consonances of the same kind, *viz.* a Twelfth, and a Fifth. Again, I can subdivide the line  $AB$  into 4, or 5, or 6 parts, but no further; because such is the imbecillity of the Ears, as that they cannot distinguish, without so much labour as must drown the pleasure, any more Differences of Sounds [9].

Heer we are required to note, that from the first Division doth arise only one Consonance: from the second, two: from the third, three: as this Table demonstrateth [10].

[9]

[10]

B

First



## First Figure.

$\frac{1}{2}$	Eighth						
$\frac{1}{3}$	Twelfth	$\frac{2}{3}$	Fifth				
$\frac{1}{4}$	Fifteenth	$\frac{2}{4}$	Eighth	$\frac{3}{4}$	Fourth		
$\frac{1}{5}$	Sevêteenth Major	$\frac{2}{5}$	Tenth Major	$\frac{3}{5}$	Sixth Major	$\frac{4}{5}$	Ditone
$\frac{1}{6}$	Nineteenth	$\frac{2}{6}$	Twelfth	$\frac{3}{6}$	Eighth	$\frac{4}{6}$	Fifth
						$\frac{5}{6}$	Third Minor

Heere wee have not set downe all Consonances that are ; in regard, that, to our more facile Invention of the rest, requisite it is that we first treat



## C H A P. V I.

*Of an Eighth.*

**T**Hat this is the first of all Consonances, and that which is the most easily perceived by the Hearing after an *Unison*; is manifest from the Premises, and also comprobated by experiment in Pipes: which, when blown with a breath stronger than ordinary, instantly yield a sound more Acute one Eighth. Nor is there any reason, why that sound should immediately arise to an Eighth, rather than to a Fifth, or any other Note; unlesse because an Eighth is the first of all Consonances, and that which is the least different from an *Unison*. From whence, we conceive, it doth also follow, that no sound can be heard, but it seems in some sort to resound in the ear more Acute an Eighth: and that this is also the cause, why in a Lute to the greater strings, which give Graver sounds, other smaller strings more Acute one Eighth are consociated, which are alwayes percussed at the same instant, and so effect that the Graver sounds are heard more distinctly. Whence it is manifest, that no sound which shall be consonant to one Term of an Eighth, can be dissonant to any other Term of the same Eighth.

A *second* thing to be observed concerning an Eighth, is this; that it is the greatest of all Consonancies, that is, that all other Consonancies are contained therein; or composed [11] thereof, and of others which are contained [11] therein. Which may be demonstrated from hence, that



- [12] all Consonancies consist of equall parts [12]; whence it comes, that if their Terms be more distant each from other than one Eighth, we may, without any further Division of a more Grave Term, adde one Eighth to a more Acute, of which, together with the residue, it will
- [13] appear that that is composed [13]. An Example may be  $AB$ , divided into three equall parts, of which  $AC$ ,  $AB$ , are distant by one Twelfth: we say, that Twelfth is composed of an Eighth, and the residue thereof, viz.
- [14] a Fifth [14]; for composed it is of  $AC$ ,  $AD$ , which is



- an Eighth; and  $AD$ ,  $AB$ , which is a Fifth: and so it falls out in the rest. Whence it comes, that one Eighth doth not so multiply the numbers of proportion if it compose others, as all others do; and is therefore the only Consonance which is capable of *Gemination*, or Doubling. For, if it be Geminated, it makes only 4
- [15] [15], or 8, if regeminated: but if a Fifth be Geminated, which is the First after an Eighth, it makes 9
- [16] [16]: for from 4, to 6, is a Fifth; in like maner from 6, to 9; which number is far greater then 4, and exceeds the series of the first six Numbers, in which we have
- [17] formerly included all Consonances [17].

From this it naturally follows; that of all Consonancies, of what kind soever, there are but three Species: one is Simple: another Compound of a Simple and an Eighth: a third composed of a simple and 2. Eighths. Nor can any other Species be added, which is composed of 3 Eighths, and another simple Consonance; because these are the extream limits; nor is there



there any progression beyond three Eighths ; since then the numbers of Proportions would be multiplied excessively. From whence is deduced a generall Catalogue of all Consonances whatever, which is here presented in the following Table.

Second Figure.

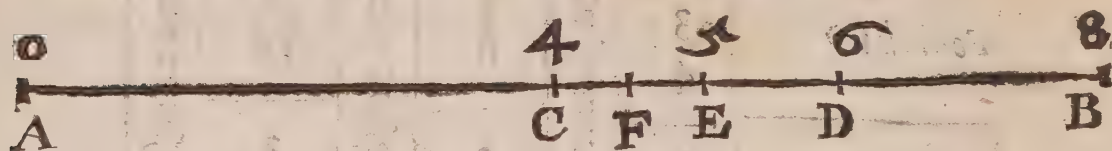
<i>Eighths</i>	$\frac{1}{2}$	<i>Simple Consonances.</i>	$\frac{1}{4}$	<i>First Compound Consonances.</i>	$\frac{1}{8}$	<i>Second Compound Consonances.</i>
<i>Fifths</i>	$\frac{2}{3}$		$\frac{1}{3}$		$\frac{1}{6}$	
<i>Ditones</i>	$\frac{4}{5}$		$\frac{2}{5}$		$\frac{1}{5}$	
<i>Fourths</i>	$\frac{3}{4}$		$\frac{3}{8}$		$\frac{3}{16}$	
<i>Sixths majors</i>	$\frac{3}{5}$		$\frac{3}{10}$		$\frac{3}{20}$	
<i>Thirds minors</i>	$\frac{5}{6}$		$\frac{5}{12}$		$\frac{5}{24}$	
<i>Sixths minors</i>	$\frac{5}{8}$		$\frac{5}{16}$		$\frac{5}{32}$	



Here have we added the *Sixth Minor*, which we had not observed in the precedent Chapter; in regard it may be educed from what hath been sayd of an Eighth, from which if a Ditone be cut off, the remainder will  
 [18] be a Sixth Minor [18]. But of this more clearly anon.

Wheras we even now affirmed, that all Consonances  
 [19] were comprehended in an Eighth [19]; we are concerned to inquire how that comes to passe, and how they proceed from the Division thereof, that so their nature may be the more plainly and distinctly understood.

First, it is most certain, that that Division of an Eighth, from which all Consonances arise, ought to be Arithmetically, or into equall parts: now what that is, which ought to be divided, is evident in the string *AB*, which is distant from *AC*, the part *CB*; but the



found *AB*, differs from the found *AC*, an Eighth: therefore will the space of an Eighth be the part *CB*. That therefore is it, which ought to be divided into two equalls, that the whole Eighth may be divided, which  
 [20] is effected in *D* [20]. From which Division, that we may understand what Consonance is properly, and *per se* generated; we are to consider that *AB*, which is the more grave Term, is divided in *D*, not in order to it self, for then it would have been divided in *C*, as was done before: nor, as the Case stands now, is an Unison divided,



ded, but an Oſtave, which conſiſts of two Terms, and therefore when the more Grave Term is divided, that Diviſion is made in order to another more Acute. Whence it comes that the Conſonance properly ariſing from the Diviſion, is between the Terms  $AC$ ,  $AD$ , which is a Fifth; not betwixt  $AD$ ,  $AB$ , which is a Fourth: becauſe the part  $DB$ , is only the reſidue, and generates a Conſonance by accident; from hence, that ſound which makes a Conſonance with one Term of an Eighth, ought alſo to make a Conſonance with the other.

Again, the ſpace  $CB$  being divided in  $D$ , I might by the ſame reaſon divide  $CD$  in  $E$  [21]; from whence a Ditone would be directly generated, and by accident all the other Conſonances: nor is it requiſite that  $CE$  be further divided; yet if that were done, viz. in  $F$  [22], then would from thence ariſe a greater Tone, and by accident a leſſer Tone, and the Semitones [23], of which hereafter: for, in a voyce, they are ſucceſſively admitted, but not in Conſonances.

Nor let any think it imaginary, what we ſay, that only a Fifth and a Ditone are generated from the Diviſion of an Eighth properly, and all other Conſonances by Accident; for Experience teacheth the ſame in the ſtrings of a Lute or other Inſtrument, whereof if one be ſtroked, the force of that ſound will ſtrike all the other ſtrings which ſhall be more Acute in any kind of Fifth or Ditone: but in the others which are diſtant a Fourth, or other Conſonance, the ſame ſhal not happen. Which force of Conſonances muſt undoubtedly ariſe from hence



hence, either from their Perfection, or Imperfection, in-  
somuch as these are first Consonances of themselves, but  
all others are only by Accident, because they necessari-  
ly flow from others.

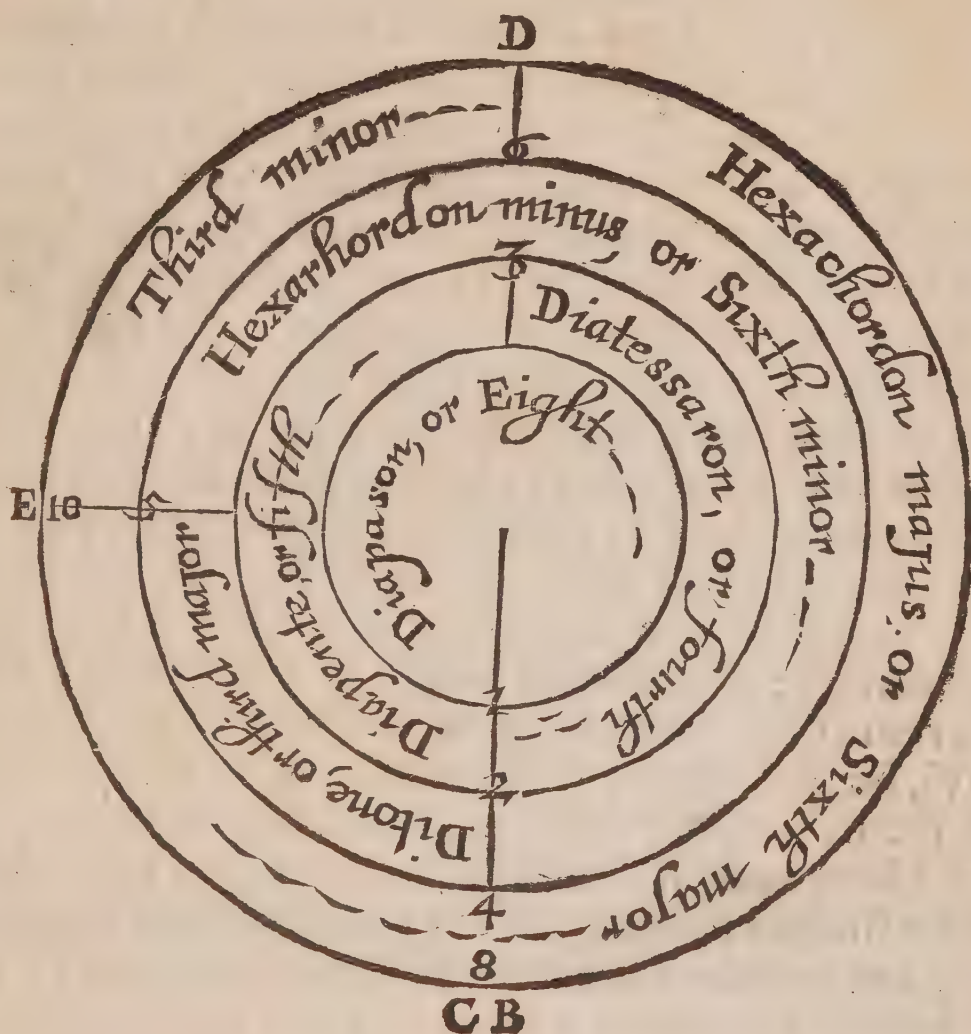
But let us enquire, whether that be true, which we  
formerly sayd, *Viz.* That all Simple Consonances are  
comprehended in an Eighth: this we shall easily justi-  
fie, if we shall turn  $CB$ , the halfe of  $AB$ , which con-  
tains an Eighth, into a Circle; so that the poynt  $B$  may  
be joyned to the poynt  $C$ . Then let the Circle be divi-  
ded in  $D$  and  $E$ , as it was divided in  $CB$ : and the reason  
why all the Consonances ought so to be found out, is  
because no sound can be consonant to one Term of an  
Eighth, but it must also be consonant to the other  
Term of the same, as we have already proved. From  
whence it comes, that if in the subsequent Figure one  
part of the Circle make a Consonance; the residue  
must also contain some Consonance.

---

*Third*



Third Figure.



From this Figure it is demonstrated how rightly an Eighth is named Diapasson, because it comprehends in it selfe all the intervalls of other Consonances. Here we have exhibited only Simple Consonances; where if we would find out also Compound ones, all we are to do is only to adde, to the intervalls above described, one or two whole Circles; and then it will appear that an

C

Eighth



Eighth doth compose all Consonances.

From what hath præceded, we collect that all Consonances may be referred to Three Kinds; for (1) either they arise from the first Division of an Unison, such are those which are called Eighths, which make the First Genus: or (2) they arise from the Division of an Eighth into two equall parts, such are Fifths and Fourths, which we may therefore call Consonances of the Second Division: or (3) they arise from the Division of a Fifth, which are Consonances of the Third and last kind. We again divide them into such Consonances as arise from those Divisions *per se*; and those which arise *per Accidens*; and that there are only three

[24] Consonances *per se* [24], we have formerly sayd, which may be confirmed from the First Figure, in which we extracted the Consonances from the Numbers themselves: For therein we are to take notice, that there are only three sonorous Numbers, 2, 3, and 5

[25] [25], for the number 4, and number 6, are compounded of them, and are therefore sonorous numbers only by Accident, as doth there appear; where, in a right order and a streight line, they do not generate new Consonances, but only such are composed from the former: for example, 4 generates a Fifteenth, and 6 a Nineteenth; but *per Accidens* and in a transvers line, 4 generates a Fourth, and 6 a Third lesser; where we are to observe by the By, that in the Number 4, a Fourth is immediately generated from an Eighth, and is in a manner a certain Monster, or difficient and imperfect Product of an Eighth [26].



## CHAP. VII.

## Of a Fifth.

**T**His, of all Consonances, is the most gratefull, and acceptable to the Ear ; and, for that reason, it is the prime and ruling Consonance in all Tunes ; as also from it do the *Modes* [27] proceed , as follows [27] from the 7 *Præconsiderable* : for since, as it is manifest from what hath preceded , whether we extract the perfection of Consonances from *Division*, or from *Numbers* [28] ; there can properly be found only three [28] Consonances , among which the fifth hath the middle place : this (certainly) is it which resounds in the ears not so sharply as a *Ditone*, nor so languid as a *Diapasson*, but the most pleasant of all others. Further, from the *second Figure* it appears, that there are three kinds of a Fifth [29], where the Twelfth possesses the mean place, [29] which we may therefore affirm to be the most perfect Fifth : from whence it follows , that we might use no other Consonance in Musick, if it were not, as we inferred in the last *Præconsiderable*, that Variety was necessary to *Delectation*.

If it be objected, that, in some cases, an Eighth may be set alone in Musick, without any Variety ; as, for Example, when two voyces sing the same Tune, one more acute than the other in an Eighth : but the same doth not evene in a Fifth ; and therefore it follows , that an Eighth ought to be accounted the most gratefull of all Consonances, rather than a Fifth.



We answer, that, from this Instance, our Assertion is rather confirmed, than infirmed; for the reason, why an Eighth may be so set, is, because it comprehends an Unison in it selfe, and so those two voyces resound in the eare as one; which happens not in a Fifth, whose Terms are more different among themselves, and therefore possesse, and exercise the Hearing more fully; from whence a certain weariness and loathing would arise forthwith, if it were set alone, and without Variety in Tunes. This may be exemplified thus; we should be sooner weary if we were constantly fed with Sugar, and Sweat-meats, than if with bread alone; which every man will allow not, in any proportion, comparable for sweetness and blandishment of the palate, to Sugar.

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## C H A P. VIII.

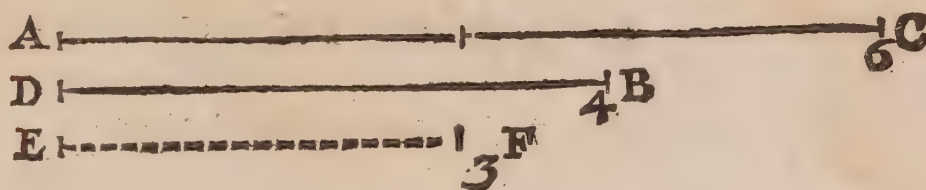
### *Of a Fourth.*

**T**His, of all Consonances, is the most unhappy; nor is it ever used in Tunes, unlesse by Accident, and with the assistance of others: not that it is more imperfect than a Third Minor, or a Sixth, but that it approacheth the nature of a Fifth so neerly, that the grace of this is drowned in the sweetnesse of that. To the understanding of which, we are to note, that a Fifth is never heard in Musick, but that, in some sort, an acuter Fourth is withall advertised; which follows from  
 [30] what we have sayd [30], that in an Unison, there is, in some sort, resounded an acuter Eighth. For Example,  
 let



let  $AC$  be in distance form  $DB$  of  $Fi$

and the reso.



nance thereof, more Acute by an Eighth, be  $EF$ ; and certainly that will be distant from  $DB$ , by one Fourth: whence it comes, that it may be called the shadow of a Fifth, which perpetually accompanies it; and thence also it is evident, why a Fourth cannot be set in Tunes, primarily, and *per se*, *i. e.* betwixt a Basse and another part. For when we sayd, that other Consonances were necessary in Musick, only in order to the variation of a Fifth; certainly, it is evident, that a Fourth would be uselesse, in regard it cannot vary a Fifth: which appears from hence; that, if it were set in a more Grave part, it would alway resound more Acute than a Fifth, where the Hearing would soon perceive that it is disturbed from its proper place to an inferiour one, and so a Fourth would bee most harsh and unpleasant thereto, as if only the shadow were presented instead of the body, or the Image objected instead of the Thing it selfe.



## C H A P. IX.

*Of a Ditone, a Third Minor, and Sixths.*

**T**Hat a *Ditone* is, by many degrees, more perfect than a Fourth, is manifest from the Premises; to which, nevertheless, we shall adde this; that the Perfection of any Consonance is not to be desummed precisely, from the same, while it is Simple; but also from all the Compounds thereof: the reason whereof is, that it can never be heard alone so jejune and empty, but the resonance of this composed is also heard together with it; since that, in an Unison, the resonance of a more Acute Eighth is contained, we have formerly evicted. Now, that a Ditone, so considered, doth consist of lesser Numbers than a Fourth [31], and is therefore more perfect than a Fourth; is plain from the *Second Figure*: wherein we, therefore, placed a Ditone before a Fourth, insomuch as we endeavoured, in that Figure, to place all Consonances according to the order of Perfection.

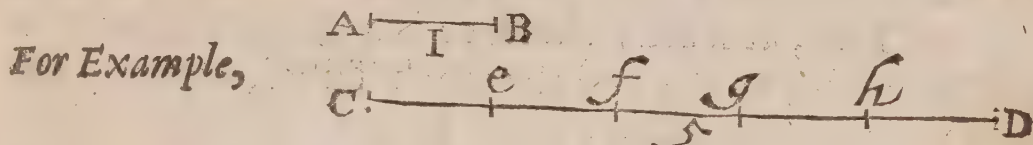
But here we are obliged to explain, why the third *Genus* of a Ditone is the most perfect, and makes, in the strings of a Lute, a Tremulation perceptible even by the sight; rather than the First, or Second Genus: which we conceive to proceed from hence; that this Third doth consist in a *multiplied Proportion*, but the First in a super-particular, the Second in a multiplied and super-particular, together [32]. And why, from multiplied proportion, the most perfect Consonances do arise; which we therefore placed in the First order of the

*First*



*First Figure*, we thus demonstrate.

Let the Line  $AB$  be distant from  $CD$ , in the Third Genus of a Ditone, howsoever men shall imagine the sound to be perceived by the Hearing; certain it is that it is more easie to distinguish what is the pro-



portion betweene  $AB$  and  $CD$ , than betweene  $CF$  and  $CD$ ; because it will first bee knowne directly by the application of the sound  $AB$ , to the parts of the sound  $CD$ , viz.  $Ce$ ,  $ef$ ,  $fg$ , &c. nor will there be any residue in the end: which falls not alike in the proportion of the sound  $Cf$ , to  $CD$ ; for if  $Cf$  be applied to  $fh$ , there will be the residue  $hD$ , by the reflection of which we ought to know what is the proportion between  $Cf$  &  $CD$ , which is more difficult or tedious. By the same way will it be conceived, if any say that a sound doth strike the ears with many percussions or verberations, and that by so much the more swiftly, by how much the more acute the sound is; for then, that the sound  $AB$  may arrive at the requisite Uniformity with the sound  $CD$ , it ought to strike the ears with only five touches or verberations, while  $CD$  strikes only once: but the sound  $Cf$  will not so soone returne to an Unisonance, for that cannot be done but after the second stroke of the sound  $CD$ , as is described in the superiour Demonstration. The same will also be explained, however we conceive the sound to be heard.

A *Third Minor* ariseth from a Ditone, as a Fourth from a Fifth [33], and is therefore more imperfect than [33]



a Fourth, as a Ditone, is than a Fifth. Nor is it therefore to bee excluded Musick, since it is not onely not uselesse, but even necessary, in order to the variation of a Fifth. For, since an Eighth is alwayes heard in an Unison, it cannot adfer this variety; nor a Ditone alone, (for there can be no variety unlesse betwixt Two, at least:) therefore is a Third Minor associated thereto, to the end that such Tunes, wherein Ditones are more frequent, may be distinct from such as have a Third Minor very often iterated in them.

[34] A *Sixth Major* proceeds from a Ditone, and by the same reason participateth the nature thereof, as a Tenth Major, and Seventeenth [34]: to the understanding of which, we are to look back upon the First Figure, where, in the number Foure, are found a Fifteenth, an Eighth, and a Fourth, which is the First Compound Number, and which, by a Binary, (which representeth an Eighth,) is resolved even into an Unity; whence it comes that all Consonances generated from it, are apt and convenient for Composition, among which since a Fourth is found, (which, for that respect, we formerly called a Monster, or defective Eighth;) thence doth it follow, that the same is not unprofitable in composition, where the same reasons do not recur, which hinder it from being set alone; for then is it perfected by the adjunct, and remains no longer subject to a Fifth,

[35] A *Sixth Minor* proceeds from a Third Minor, in the same manner as a Sixth Major doth from a Ditone [35], and so borrows the nature and affections of a Third Minor: nor is there any reason to countermand it.

Here the Series of Consonances would Exact from us a Discourse concerning their various *Virtues*, as to the excitement



excitement of *Passions*: but a more exact Disquisition of this, may be collected from the *Præcedents*; and it exceeds the limits of a *Compendium*. For, so various are they, and upon so light circumstances supported; that, a whole Volume would not suffice to perfect their Theory. This, therefore, shall we only say, that the chiefest Variety doth arise from these four last; whereof a Ditone and Sixth Major are more gratefull, more sprightfull, and exhilarating than a Third and Sixth Minor; as hath been observed by *Practicall Musicians*, and may be easily deduced from hence, that a Third Minor is generated from a Ditone only by Accident, but a Sixth Major *per se*, because it is no other but a Ditone Compound.

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## C H A P. X.

### *Of Degrees, or Tones Musicall.*

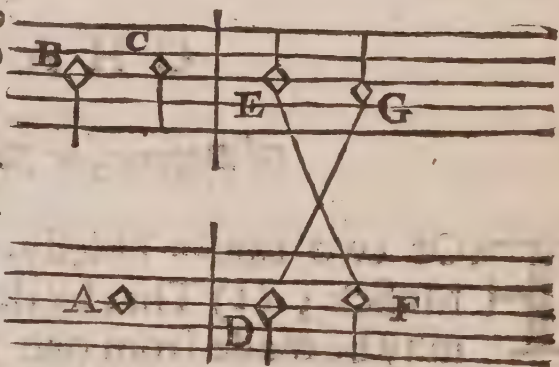
**F**OR two causes chiefly are Degrees required in Musick; (1) That by their assistance a Transition may be made from one Consonance to another, which cannot, so conveniently, be effected by Consonances themselves with Variety, the most gratefull thing in Musick: (2) That all that space, which the sound runs over, may be so divided into certain intervals, as that the Tune may alwayes passe through them more commodiously than through Consonances.

If we consider them in the first capacity; there can be only Four kinds of Degrees, and no more: For then they ought to be desumed from the inequality, found  
 D between



[36] between Consonances, and all Consonances are distant each from other  $\frac{1}{9}$  part, or  $\frac{1}{16}$ , or  $\frac{1}{16}$ , or finally  $\frac{1}{25}$  [36]; besides the intervals which make other Consonances: therefore all Degrees consist in those numbers, the two first Tones whereof are called Major and Minor, and the two last are called Semitones, Major and Minor. But we are to prove that Degrees, considered in this capacity, are generated from the inequality of Consonances; which is thus done. So often as there is a transition made from one Consonance to another, either one Term is moved single, or both together; and by neither of these two ways can any such transition be made, unlesse by those intervals, which design the inequality betwixt Consonances: Therefore. The first part of the Minor is thus demonstrated.

[37] [37] Let from *A* to *B*, be a Fifth; and from *A* to *C*, be a Sixth Minor; and, of necessity, from *B* to *C* will be that difference, which is betwixt a Fifth and a Sixth Minor, viz.  $\frac{1}{16}$ , as is evident [38]: but that the



[38] Posterior part of the Minor may be proved, wee are to observe; that wee are not, in sounds, to regard only the proportion while they are emitted together, but also while they are emitted successively, so that, as much as possible, the sound of one Voyce ought to keepe Consonance with the immediately præcedent sound of the other voyce; which can never bee effected, if the Degrees did not arise from the inequality of Consonances. For Example, let *D E* be a Fifth, and let each Term be moved



moved by contrary motions, so that a Third Minor may be created; if  $DF$  be an intervall, which doth not arise from the inequality of a Fourth to a Fifth,  $F$  cannot, by relation, be consonant to  $E$ ; but if yea, then it can: and so likewise in the rest, as may soon be experimented. Here observe, that as concerning that Relation, we sayd it ought to be consonant so much as possible: for alwayes it cannot be, as will appeare in the succeeding Discourse.

But if wee consider them in the second Capacity; namely, how these Degrees may, and ought to be ordained in the whole intervall of sounds, that by them one solitary voyce may be immediately elevated, or depressed; then, among the Tones already found out, those Degrees shall only be accounted Legitimate, into which the Consonances are immediately divided. To the manifestation of this, wee are to advert, that every intervall of sounds is divided into Eighths, whereof one can by no means differ from another, and therefore that it is sufficient, if the space of one Eighth be so divided as that all the Degrees may be obtained: as also, that that Eighth is already divided into a Ditone, a Third *minor*, and a Fourth [39], all which evidently follow from what wee have sayd concerning the last Figure of the Superior Tractate. [39]

Hence also is it manifest, that Degrees cannot divide a whole Eighth, unless they divide a Ditone, a Third *minor*, and a Fourth; which is thus done. A Ditone is divided into a Tone *major*, and a Tone *minor* [40]; a Third *minor* is divided into a Tone *major*, and a Semitone *major* [41]; a Fourth, into a Third *minor*, and also a Tone *minor* [42], which Third is again divided into a

D 2
Tone

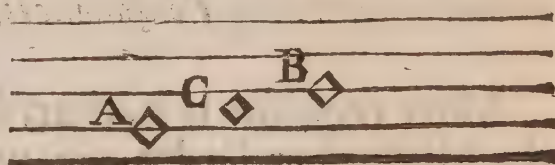


- [43] Tone *major*, and a Semitone *major* [43]; and so the whole Eighth doth consist of three Tones *major*, two Tones *minor*, and two Semitones *majora*; as is manifest to him who seriously and exactly perpend their Scheme. And here we have only three Kinds of Degrees; for a Semitone *minus* is excluded, because it doth not immediately divide Consonances, but only a Tone *minor*. As for Example, if it be sayd that a Ditone doth consist of
- [44] a Tone *major*, and both Semitones [44] (for both Semitones compose a Tone *minor* [45]): but wherefore, will
- [45] you say, is not that Degree also admitted, which resulteth from the Division of another, and divides Consonances onely *Mediately*, not immediately? our Answer is, that the Voyce cannot run through so many various Divisions, and at the same instant be consonant with an other different voyce, unlesse with extream Difficulty, as is open to Experiment: besides, a Semitone *minus*
- [46] would then be joyned to a Tone *major* [46], with which it would create a most unpleasant Dissonance; for consist it would between these numbers 64 and 75 [47], and
- [47] therefore the voyce could not bee moved through such an intervall. But, in order to the clearer solution of this Objection, we are to note;

That to the Creation of an Acute sound, is required a more forcible emission of the breath, or spirit in vocation Musick; or a stronger percussion of the strings in instrumentall; than is required to the Creation of a Grave: which is experimented in the strings of a Lute, which yield a sound by so much the more Acute, by how much the more they are distended; as also from hence, that by a greater force, the Aer is divided into lesser parts, from which the more Acute sound must of necessity



necessity be generated: and from hence it is a direct Consequence, that by how much the more Acute a sound is, by so much the more strongly doth it strike the eares. From this animadversion, I conceive, a true and chiefe reason may be rendred, wherefore *Degrees* were invented; viz. least, if the voyce should run through the Termes of Consonances alone, there would bee among them too great a disproportion in the reason of intension, which would inevitably tire both the Auditors and Singers. For Example, would I ascend from *A* to *B*, because the sound *B* wil strike the ears



far stronger, than the sound *A*, lest that Disproportion should be incommodious, the Term *C* is set in the midle, by which we may, as by a Degree, more easily, and without that inequall contention of the breath, ascend to *B*. From which it is manifest, that *Degrees* are nothing elss but a certaine *medium*, interposed betweene the Termes of Consonances, for the moderation of their inequality; and that of themselves they have not sweetnesse enough to satisfie the ears, but are only considerable and usefull in order to Consonances; so that while the Voyce runs through one Degree, it leaves the Hearing unsatisfied, untill it shall have arrived at a Second; which, for that respect, ought, together with the former Degree, to constitute a Consonance: and this is sufficient to solve the præcedent Objection. Moreover, this also is the reason, why, in a Voyce, successively *Degrees* are admitted, rather than Ninths or Sevenths, (which arise from *Degrees*,) or others which do consist of lesse Numbers than *Degrees*; namely, because intervals of this sort do not



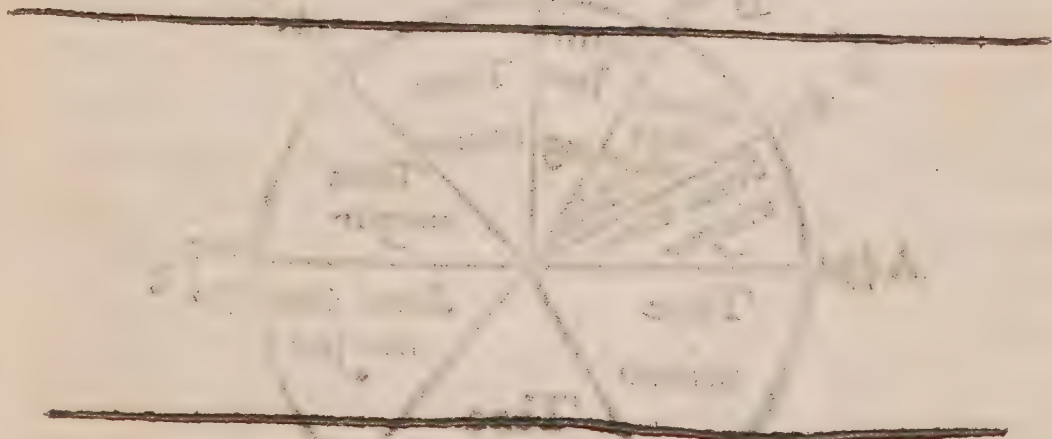
divide the least Consonances, nor can they therefore moderate that inequality, which is betwixt their Terms. More, concerning the invention of *Degrees*, (which arise from the Division of a Ditone into two parts, as a Ditone doth from the Division of a Fifth,) might be super-added; and many things from thence be deduced, which concern their sundry *Perfections*: But it would require more room than a *Compendium* can afford, and a good Understanding may infer as much, from what hath preceded concerning *Consonances*.

- More requisite it is, that, in the present, we speak of the Method or Order, in which those Degrees are to be constituted in the whole space of an Eighth; now this Order ought to be such, as that a Semitone *majus*, [48] may have on each side next to it a Tone *major* [48]; as [49] also a Tone *minor* [49], with which this doth compose a Ditone; and the Semitone a Third *minor*, according [50] to what we have just now observed [50]: but since an Eighth containeth Two Semitones, and as many Tones *minor*; that this may be obtained without Fraction, it [51] ought also to containe Foure Tones *major* [51]: Now because it containes only three, therefore is it necessary, that, in some place, wee use a certaine Fraction, which [52] may be the difference betwixt a Tone *major* and a Tone [52] *minor*, which we nominate a *Schism* [52]; or also between a Tone *major* and a Semitone *majus*, which contains a Semitone *minus* with a *Schism* [53]: to the end, [53] that by the helpe of these Fractions the same Tone *major* may, after a sort, bee made moveable, and so perform the office of two Tones; which is easily preceptible in

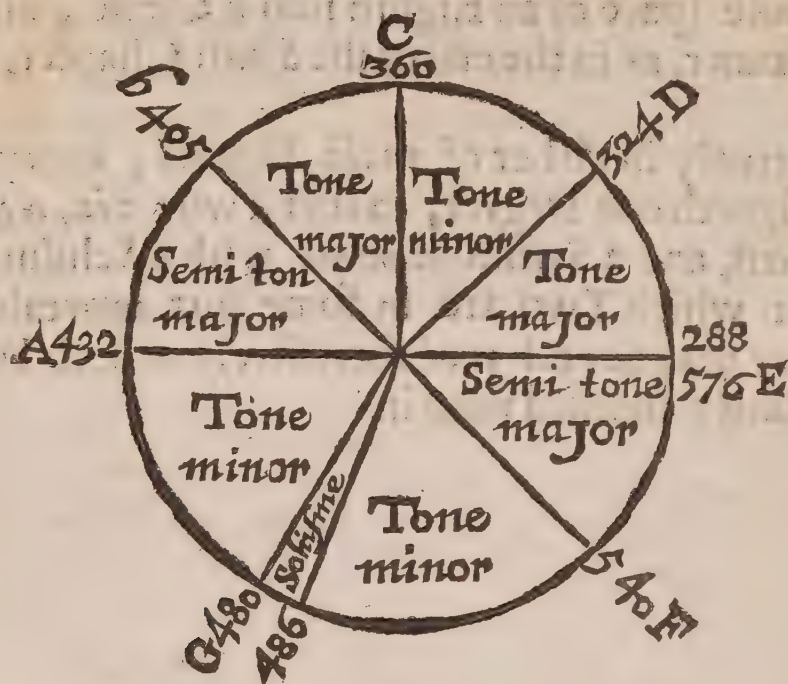


in the Figures here delineated, where we have turned the whole space of an Eighth into a Circle, after the same manner, as in the end of the Sixth Chapter.

And truly in either of these Figures, every intervall designeth one Degree, except Two: viz. a Schism in the First, and a Semitone *minus* with a Schism in the Second: which Two are in some sort moveable, so that they may bee referred successively to both Degrees immediately annexed unto it.







Now,



Now, manifest it is from these Figures, (1) That, in the First Figure, there can be no ascension by Degrees from 288 [54] to 405, unlesse wee emit the middle Term in some sort tremulous or quavering; so that if it respect 288, it may seeme to bee 480, but if it respect 405, then it may seeme to bee 486, viz. that with both it make a Third *minor*, and the difference is so small betwixt 480 and 486, that the mobility of that Terme, which is constituted from both, doth not strike the Hearing with a Dissonance perceptible.

(2) In the Second Figure, after the same reason, we cannot ascend from the Terme 480 to 324, by Degrees; unlesse wee so expresse the middle Terme, as that, if it respect 480, it may seem 384; if it respect 324, it may be 405, that so, with both, it may make a Ditone. But because betwixt 384 and 405, the difference is so great, that no voyce can be so tempered of them, as that if it hold a Consonance with one of the extreames, but it will appeare exceedingly Dissonant from the other: therefore is another way to bee sought, by which (the most of all others) this so great an incommodity may be, if not totally removed, yet at least greatly diminished. Now this can be no other way, but what is found and described in the Superiour Figure, viz. by the use of a Schism: by this means, if wee would goe through the Terme 405. Wee will remove the Terme G, by one Schism, that it may be 486, no more 480: and if wee would goe through 384, we will change the Terme D, and 320 shall be in the place of 324, and so shall be distant, by a Third *minor*, from 384.

E

From



From these considerations it is evident, that all the spaces, through which one voyce solitary may bee moved, are contained in the First Figure: for, when the incommmodity of the Second Figure is corrected, then  
[55] doth it not differ from the First [55]; as is easily comprehended.

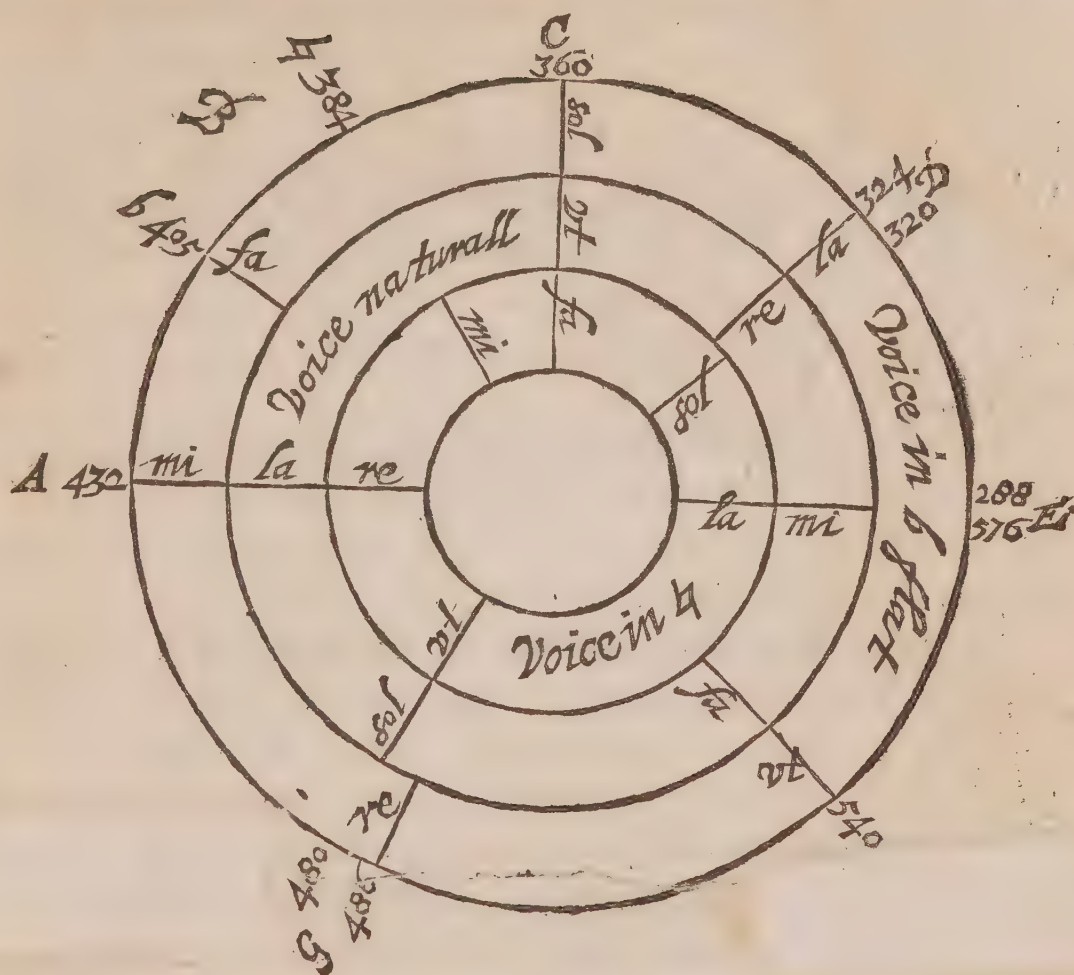
Evident it is also, that that Order of Tones, which practi-  
cally Musicians call the *Hand*, doth contain all the Modes, by which Degrees may be ordained; for, that they are comprehended in the two precedent Figures, is formerly proved: and that Hand of Practicall Musicians doth contain all the Termes of each Precedent Figure, as is easily discerned in the following Figure, in which we have turned that Hand, into a Circle, that so it might the better be referred to the Superiour Figures. Yet, to the understanding of this Figure, we are to signifie, that it begins from the Term *F*, where, for that cause, we have applyed the greatest number, that thence it might be collected that that Term is of all the  
[56] most *Grave* [56].

---

*Figure*



Figure the Sixth.



That it ought to be so, is inferred from hence ; that we can begin Divisions from onely two places of the whole Eighth : so that therein either two Tones may be set in the first place , and, after one Semitone, three Tones consequent in the last place ; or, on the contrary, three Tones in the first place, and only two in the last. And the Term *F* representeth both those two places together



gether. For, if from thence we go by *b*, only two Tones, are in the first place : but if by *p*, there will bee three: Therefore.

First, then it is manifest from this Figure, & the second precedent, that onely Five Spaces are contained in a whole Eighth, by which the voyce can naturally proceed, *i.e.* without any Fraction, or moveable Terme, which was to bee found out by Art, that it might proceed further. Whence it came, that those five intervalls should be attributed to a Naturall Voyce, and six only Voyces were found out to expresse them; *viz. ut, re, mi, fa, sol, la.*

Secondly, that from *ut* to *re*, is alwayes a Tone *minor*; from *re* to *mi*, alwayes a Tone *major*; from *mi* to *fa*, alwayes a Semitone *major*; from *fa* to *sol*, alwayes a Tone *major*; and lastly from *sol* to *la*, a Tone *minor*.

Thirdly, that there can be only two Kinds of an Artificiall Voyce, *viz. b* and *p* : because the space betwixt *A* and *C*, which is not divided in the Naturall voyce, can only bee divided by two Modes; so as that a Semitone be set in the first place, or the second.

Fourthly, for what reason these Notes, *ut, re, mi, fa, sol, la*, are againe repeated in those Artificiall Voyces : for Example, for, when wee ascend from *A* to *b*, inso-much as there are not other Notes, but *mi* and *fa*, to signifie a Semitone *major*; it thence follows, that in *A*, *mi* is to be set; and in *b*, *fa*; and so in other places in order. Nor can you say, it had been more convenient to have invented other Notes; for they would have been superfluous, since they must have designed the same intervalls, which are designed by those Notes in a Naturall voyce; besides they would have been incommodi-  
ous,



ous, because so great a multitude of Notes must have exceedingly troubled Musicians, as well in setting, as singing of Tunes.

And lastly, how changes may bee made from one voyce to another, viz. by Terms common to two voyces: as also, that these voyces are mutually distant by a Fifth [57]; and that the voyce *b* Flat, is of all the most Grave, because it begins from the Term *F*, which we have formerly proved to be the first; and therefore it is called *b* Flat or Soft, in respect that by how much any Tone is the more Grave, by so much is it the more soft and remisse. For to the emission thereof is required the lesse spirit, or breath, as wee have more then once intimated. And a Naturall voyce is and ought to be a mean, nor could it rightly be called *Naturall*, if the voyce were to be elevated, or depressed beyond Mediocrity, in the expression thereof. Finally, the voyce *♯*, is called a Quadrate, or Sharp, because it is the most Acute, and the opposite to *b* Soft or Flat; as also, because it divides an Eighth into a Tritone and a Fifth false [58], and is therefore lesse sweet than *b* Soft.

Some perhaps will object, that this *Hand* is not sufficient to comprehend all the Changes of Degrees; for, as in it is shown, how freely we may deflect from a Naturall voyce, either to *b* Soft, or to *♯*; so also ought other collaterall Orders to bee designed therein, such as are set in the Sequent Figure; that so it might have beene free for us also to deflect from *b* Soft, to the Naturall voyce, or to the other part; and so from *♯*. Which is confirmed from hence, that Musicians in Practice frequently use such intervals, which they explicate either by Diesis, or by *b* Soft, which they therefore remove from its proper Seat.



270							
288			mi	la	re		
303 <sup>8</sup> 303 <sup>7</sup>	fa	b					
320 324	mi	la	re	sol	ut		
336 362 <sup>1</sup> 362 <sup>2</sup>	re	sol	ut	fa			
384			Voice	mi	la		
405	ut	fa	naturall				
422 <sup>2</sup> 432 <sup>3</sup>		mi	la	re	sol		280
480 485	la	re	sol	ut	fa		
512				4	mi		
540	sol	ut	fa				

To this we return, that by this means might be made a progresse, *usq; ad infinitum* : but, in that *Hand*, ought to bee expresse the Changes of only one Tune ; and that those are contained within three Orders, is demonstrated from hence, that in every Order only six Terms are contained , of which two are changed , when a change is made to the following Order, and so there remain therein only Four Termes of those, which were in the former ; but if a Transition bee againe made to a Third Order, then will two Degrees of the four precedent ones bee changed, and so there will remain onely two of those which were in the former Order , which would lastly be taken away in the fourth Order, if the progresse should be continued unto it, as is visible in the Figure:



Figure : whence it is most evident that the Tune would not be the same it was in the beginning, since therein would remaine no Term unchanged. And what is added concerning the use of *Dieses* ; I say, that they doe not constitute whole Orders, as *b* Soft, or *p*, but consist only in one Terme, which they elevate (as I conceive) by one Semitone *min*, all the other Terms of the Tune remaining unchanged ; now the manner how, and the reason why this is done, I doe not at present so well remember, as to be able sufficiently to explain ; nor why, when only one Note is elevated above *la*, a *b* Soft is usually affixed unto it : which I think may easily be deduced from Practice, if the Numbers of those Degrees, in which they are used, and of voyces, which with them make Consonances, bee subducted ; and the matter I judge well worthy a serious Meditation.

Finally, here it may be objected, that six voyces, *ut*, *re*, *mi*, *fa*, *sol*, *la*, are superfluous, and only Four may suffice ; since there are only three divers intervalls : by which way that any Musickall Tune can be sung, I deny not. But because there is great difference betwixt the Terms Grave and Acute ; and a Grave Term, as is formerly noted, is much the chiefest : therefore is it better and more commodious to use divers Notes, than the same towards an Acute part, and towards a Grave part.

This place requires us to explain the *Practice* of these Degrees, how Musickall parts are constituted of them, and by what reason ordinary Musick composed by practick hands may be accommodated to what of the Theory hath been premised ; that so all Consonances and other its intervalls may bee exactly calculated. In  
order



order to our effecting of this, wee are to know, that Practitioners describe Musick betweene five lines, to which others also are added, if the Tones of the Tune bee further extended; and that these Lines are distant each from other, two Degrees, and therefore that betwixt two of them, one other is alwayes to bee understood, which is omitted for brevity & commodity sake. Again, since all the Lines are equally distant each from other, but signifie unequall spaces: therefore are Two Markes invented, *b* and *p*, one whereof is set in that chord, which represents the Term *B fa*, *p mi*. Further, because one Tune doth frequently consist of many parts, which parts are seperately described; it is not yet known, from those Marks, *b* and *p*, which of these many parts is superior, and which inferior: and therefore are there three other Marks found out. *);*, *|≡|*, *G*, the order whereof we have formerly observed [59]. Now that all these things may be the more manifest, wee have here placed this following Figure, in which wee have expressed all the Chords, and removed them each from other more or lesse, according to the greater or lesser spaces which they denote [60]; that so the proportion of Consonances might be presented together to the eye. Besides, wee have made this Figure double, that the Difference betwixt *b* and *p*, might be visible; nor can those Tunes, which are to be sung by one, be described by the other, unlesse all the Tones of these be removed by a Fourth or Fifth, from their proper Seat, so that where stands the Term *F ut fa*, there is to be set *C sol ut fa*.

Further



6 flat			4 Sharpe	
E			la	72
D			sol	80 or 81
C			fa	90
B	b		mi	96
A			re	108
G	g		sol g	120
F			fa	135
E			mi	144
D		la	re	160 or 162
C	H	sol	re	180
B	b	fa	7	192
A		mi		216
G		re		240
F	F:	ut	F:	270
E				288
D				320 or 324
C				360
B	b	85c	7	384
A		405		432
G		432		480
F		480 or 486		540
E		540	F:	540

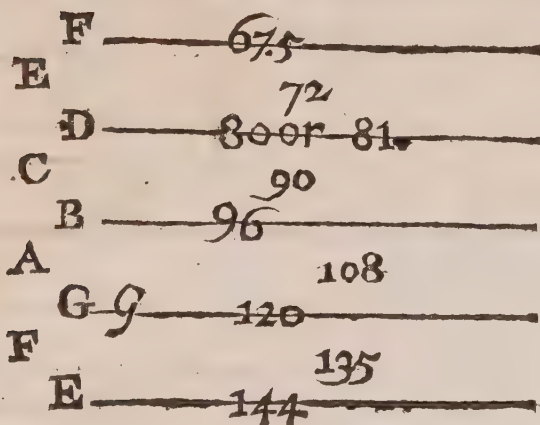
Further than this we are not to goe, for these ought to be the Terms, since they divide three Eights, within which all Consonances are included, to which the Practice of Musicians doth accord, for they hardly ever exceed this space.

F

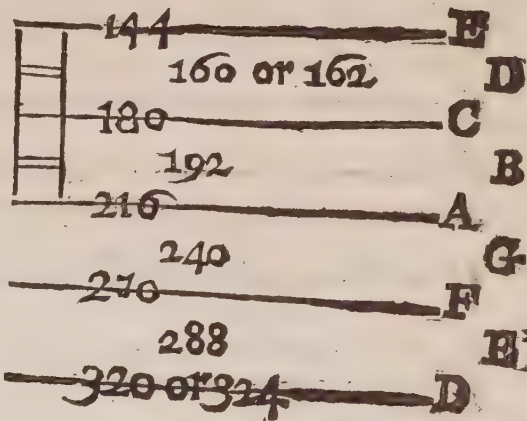
Superius.



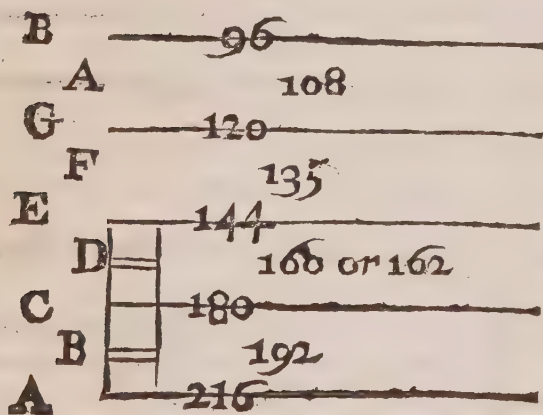
## SUPERIUS.



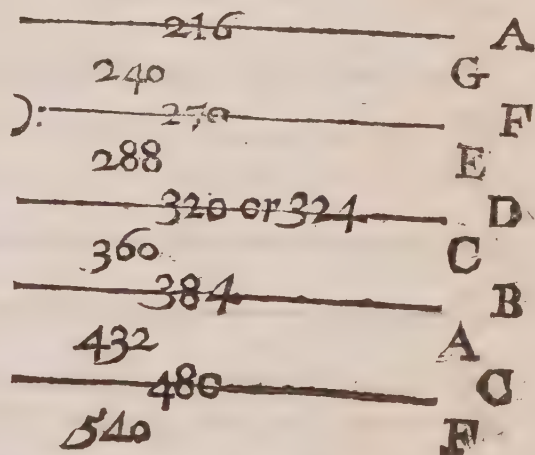
## TENOR.



## CONTRA TENOR.



## BASSUS.



Now the use of these Numbers is, to teach what proportion all the Notes hold among themselves, such as are contained in all the parts of one Tune : for the sounds of these Notes hold the same proportion one to another, as the numbers apposed on the same Chords. So as if the string be divided into 540 equall parts, and the sound thereof represent the most Grave Term F :

480



480 parts of the same string will yield the sound of the Term G; and so consequently.

And here we have ordered 4 degrees of Parts, that it might appear, how much they ought to be distant each from other; not that the Cliffs  $\gamma$ ,  $\beta$ , and  $\alpha$  are not often set in other places, which is done according to the variety of Degrees, which are run over from each part: but because this Mode seems to be the most Naturall, and is the most frequent.

Again, here have we set Numbers only in the Naturall Chords, and so long as they are not removed from their proper seat; but if Dieses be found in some notes, or  $b$ , or  $\sharp$ , which may remove them from their proper seats: then are those to be explicated by other Numbers, whose quantity is to be desumed from other Notes of other Parts, with which these kinds of Dieses make a Consonance.

## CHAP. XI.

### Of Dissonances.

**A**L L other Intervalls, except those of which wee have now spoken, are called Dissonances; but we will treat of those only, which are necessarily found in the newly explicated order of Tones, so as they cannot but be made use of and applied.

Of these there are three kinds [61]: (1) Some are generated from Degrees only, and an Eighth: (2) Others from the difference which is betwixt a Tone *major* and *minor*, which we have denominated a Schism: and



(3) others from the Difference, which is between a Tone  
 [62] *major*, and a Semitone *majus* [62].

In the *First Genus*, are contained *Sevenths* and *Ninths*,  
 or *Sixteenths*, which are only *Ninths* compounded, as  
*Ninths* are nothing else but *Degrees* compounded of an  
*Eighth*, and *Sevenths* nothing but the residue of an  
*Eighth*, from which one *Degree* is detracted; whence  
 it is manifest, that there are three divers *Ninths*, and  
 three *Sevenths*, because there are three kinds of *De-*  
 grees; and all these consist betwixt these Numbers  
 [63] [63]:

$$\begin{array}{ll}
 \left. \begin{array}{l} \text{Ninth maxim} \\ \text{Ninth major} \\ \text{Ninth minor} \end{array} \right\} A & \begin{array}{l} \frac{4}{9} \\ \frac{2}{3} \\ \frac{15}{32} \end{array} \\
 \left. \begin{array}{l} \text{Seventh major} \\ \text{Seventh minor} \\ \text{Seventh minim} \end{array} \right\} A & \begin{array}{l} \frac{8}{15} \\ \frac{2}{3} \\ \frac{2}{16} \end{array}
 \end{array}$$

Among *Ninths*, two are *majors*, which arise from  
 two *Tones*, the First from a *major*, the Second from a  
*minor*, for the distinction of which we have noted one  
*Ninth maxim*: on the contrary there are two *Sevenths*  
*minors*, for the same reason, and therefore we have cal-  
 led one *Seventh minim*.

Now, that these *Dissonances* cannot be avoyded in  
 sounds successively emitted, among divers parts is most  
 clear: yet haply any one may enquire, why they ought  
 not to be admitted in a *voice* successive of the same  
 part equally with *Degrees*, since it is evident that some  
 of them are explicated in lesser Numbers than the *De-*  
 grees themselves, and therefore may seem to bee more  
 gratefull to the Hearing than *Degrees* [64]. The soluti-  
 on of which Doubt doth depend on this, which we have  
 [65] before observed, that a *voice* [65] doth require so much  
 the



the more intension of the spirit or breath, by how much the more Acute it is, and therefore Degrees were invented, that they might be *Meanes*, betwixt the Termes of Consonances, and that by them wee might the more easily ascend from the Grave Terme of any Consonance to the Acute of the same, or *vice versa*, descend from the Acute to the Grave Terme: which cannot be performed by Sevenths or Ninths, as is evident from hence, that the Termes of these are more distant each from other, than the Termes of Consonances are, and therefore they would be emitted with a greater inequality of Contention.

In the *Second Genus* of Dissonances do consist a Third *minor*, and a Fifth Deficient by one Schisme; as also a Fourth, and a Sixth *major* encreased by one Schisme. For since (necessarily) there is one moveable Terme by the intervall of a Schisme, in the whole Series of Degrees; it cannot be avoyded, but that, from thence, such Dissonances in relation, *i.e. in voce successive emissa a diversis vocibus*, will be generated: And that more then these now named cannot arise from thence, may be proved by induction [66]. These consist in these Numbers [67]:

A	Third minor defective	$\frac{27}{32}$
	Fifth defective by one Schism	$\frac{27}{40}$
	Fourth increased by one Schism	$\frac{20}{27}$
	Sixth major increased by a Schism	$\frac{48}{81} \frac{16}{27}$

F<sub>3</sub>

Or

[66]

[67]



[68]

Or thus [68],

A {	Third minor defective	{	G ad b.	480, 405.	}
	by a Schism		p ad D.	384, 324.	
	Fifth defective by one	{	G ad D.	480, 324.	
	Schism				
	Fourth encreased by	{	D ad G.	324, 240.	
	one Schism				
	Sixth major encreased	{	b ad G.	405, 240.	}
	by a Schism		D ad p.	324, 192.	

But so great are these Numbers, that such intervalls cannot be tollerated of themselves; but, as we have formerly noted, because the intervall of a Schisme is so small, as it can hardly bee discerned by the ears, therefore doe they borrow sweetnesse of those Consonances, to which they are nearest. Nor doe the Terms of Consonances so consist in *indivisibili*, as that if one of them be a little changed, all the sweetnesse of the Consonance must instantly be lost: and this can only be the reason, why Dissonances of this *Second Genus* may be, in a voice successive of the same part, admitted in place of Consonances, from which they are divided.

In the *Third Genus* are contained, a Tritone, and a Fifth false; for in this, a Semitone *major* is accounted for a Tone *major*; but in a Tritone, the Contrary: and they are explicated by these numbers [69]:

[69]

Tritone  $\frac{32}{45}$

Fifth false  $\frac{45}{64}$

Or



Or thus [70]:

A {	Tritone {	F ad $\sharp$ . 540, 384.
		b ad E. 405, 288.
{	Fifth false {	$\sharp$ ad F. 384, 270.
		E ad b. 288, 202; vel 576, 405.

[70]

Which Numbers are also too great to explicate any intervall which may not be ingrate to the ears; nor have they any Consonances very near, from which they may borrow sweetnesse, as the Præcedent ones have. Hence comes it, that these last Dissonances ought to be avoided in relation; at least, when slow and soft Musick is made, and not diminute; for in very diminute Musick and such as is sung swiftly, the hearing is too much imployed to take notice of the defects of such Dissonances: which defect is much more evident from hence, that they are near to a Fifth, with which the Hearing therefore compares them, and, from the precipuous sweetnesse of this, doth the more clearly discern the imperfection of those.

Here we shall end our explication of all the Affecti-  
ons of a Sound; having first only taken notice, in order  
to the probation of what we formerly said, that all the  
Variety of sounds, as to Grave and Acute, doth arise  
in Musick onely from these Numbers 2, 3, and 5. we  
say that all numbers, by which aswell Degrees, as Disso-  
nances are explicated, are composed of those three, and  
by them, division being made, may at length bee resol-  
ved even to an unity.



## C H A P. XII.

*Of the reason of composing.*

**F**rom the Premises it followes, that we may, without any great error or solœcism, compose Musick, if we observe these 3 axioms.

1. That all sounds which are emitted together, may be distant each from other, in any Consonance, except a Fourth, which lowest ought not to be heard, *i.e.* against a Basse.

2. That the same voice be moved successively, only by Degrees, or Consonances.

3. Lastly, That we admit not a Tritone, or Fifth false, no not so much as in relation.

But, for the greater Elegancy and Concinnity, we are to note these following Rules.

1. That wee begin from some one of the most perfect Consonances; for, so is raised a greater attention, than if some jejune and frigid Consonance led up the Van: or else, most gratefully, from a pause or silence of one voyce; for when, immediately upon the silence of one voyce, which began the Tune, another unexpected one First invades the ears, the novelty thereof doth by a kind of potent charm, conjure us to attention. Now, concerning a Pause we have been hitherto silent, because of it self a Pause is nothing, but onely induceth a certain novity and variety, while the voyce, which was silent, doth againe begin to sing.

2. That two Eights, or two Fifths never immediately



ately succeed each other. The reason why that is prohibited more expressly in these Consonances than in others, is because these are the most perfect, and therefore when one of them is heard, then is the Hearing therewith fully satisfied, and unlesse the attention bee presently removed from that to another Consonance, it is wholly occupied by the pleasantnesse thereof, so that it can little regard the variety, and the (in some sort) frigid Symphony of the Tune; which happens not in Thirds and other Consonances, no though they be reiterated, for in all others the attention is still kept up, and a desire encreased of expecting a more perfect Consonance.

3. That so much as possible, the parts goe on in contrary motions, in order to the greater variety: for then both the motion of every voice is distinguished from the adverse voice, and Consonances are distinguished from other Consonances near them. Also that all the voyces be moved oftner by Degrees, than by leaps.

4 That, when we would advance from any lesse perfect to a more perfect Consonance, wee alwayes deflect to one that is near, rather than to one that is remote; for example, from a Sixth *major* to an Eighth, from a Sixth *minor* to a Fifth, &c. understanding the same also of an Unison and the most perfect Consonances. Now, the reason why this method is to bee observed in progression from imperfect to perfect Consonances, rather than *e contra*, from perfect to imperfect; is, because, when we heare an imperfect Consonance, the eares are induced to expect a more perfect one, wherein they may receive more satisfaction, and to this expectation are they carryed by a certain naturall violence: and there-



fore ought a more vicine, than a remote Consonance rather to be set, that being what the Hearing desires. But, on the contrary, when a perfect Consonance is heard, we expect no imperfect one. Yet this Rule is subject to frequent variation, nor can we now call to mind, from what to what Consonances in particular, and by what motions wee ought to pervene: all these depend on experience, and the practice of Musicians; which being known, we conceive it no difficulty to deduce the reasons and proportions of all from this our Theory of Musick: and I have formerly deduced many of them, but my peregrinations have worn them out of both my Papers and Memory.

5. That, in the end or close of each Tune, the eares be so fully satisfied, as they expect no more, but perceive the Tune to be perfect: which is most conveniently effected by some Orders of Tones alwayes ending in a most perfect Consonance, which Orders Musicians call Cadences, all the Species of which Cadences have been copiously enumerated by *Zarlino*. Who hath Generall Tables or Schems also, wherein are described what Consonances in particular ought to succeed each other through a whole Tune; of all which hee hath given some reasons, but we believe that more and more plausible ones, may be deduced from our Fundaments.

6. And lastly, that the whole Tune together, and every voyce seperately be included within certain limits, which are called Modes, of which anon.

All these Rules are to bee exactly observed in the Counter-poynt of only two, or more voices; but not in a Diminute, nor any way varied: for in Tunes very Diminute, and (as they call them) Figurate, many of them



them are remitted. Which that we briefly explicate, wee are concerned first to treat of the foure Parts, or Voices used in Tunes; for though in some are found more, in some fewer Symphonies: yet that seems to bee the most perfect and most usuall Symphony, which is composed of four Voices.

The First and most Grave of all these Voices, is that which Musicians call *Bassus*. This is the chiefe, and ought principally to fill the ears, because all other Voices carry the chiefest respect to the *Basse*, the reason whereof we have formerly declared. Now, this Voice is wont to move on not onely by Degrees, but also *per Saltus*; the reason is, because they were invented to ease that trouble, which would arise from the inequality of the Terms of one Consonance, if one should immediately bee expressed upon the neck of another; since the more Acute doth strike the eare much more forcibly than the Grave. For this trouble is lesse in a *Basse*, than in other parts; in respect that it is the most Grave, and therefore requires lesse strength of the spirit or breath to its effusion, than any other. Besides, since all other Voices hold a respect to the *Basse*, as the principall; it ought to strike the ears more sensibly, that it may bee heard more distinctly: which is effected, when it moves on *per Saltus*, i. e. by the Terms of lesser Consonances immediately, rather than when it moves on by Degrees.

The Second, being the next to the *Basse*, they call *Tenor*; this being also, in its kind, the chiefest, because it containes the Subject of the whole Modulation, and is comparatively the Nerve, which extended through the body of the Tune, doth sustain and conjoyn all the rest of its Members. And therefore it is wont, so much as



possible, to move on by Degrees; that so its parts may be the more united, and the Notes of it may be the more easily distinguished from the Notes of other Voices.

To the *Tenor* is opposed the *Contra-tenor*; nor is it used in Musick for any other reason but because, by progressing to contrary motions it may occasion Variety, and so Delight. It is wont, as the *Basse*, to move on by leaps; but not for the same reasons: for this is done only for convenience and variety; for it consists between two voices, which move on by Degrees. Practisers so compose their Tunes sometimes, that they descend below a Tenor; but this is of small moment, nor doth it seem at any time to adfer any novity, unlesse in imitation, consequence, and the like artificiall counter-poynts.

*Superius* is the most Acute voice, and is opposed to *Bassus*, so that by contrary motions they frequently occur each to other. This voice ought chiefly to incede by Degrees; because, since it is most Acute, the difference of Terms in this would cause greater trouble and difficulty, if those Terms, which it would successively emit, were at too great distance each from other. And it is wont to be moved the swiftest of all others in Diminute Musick: as the *Counter-Basse* most slowly: the reasons whereof are deduceable from our precedent discourse; for a more remisse sound strikes the Ears more slowly, and therefore the Hearing cannot endure so swift a mutation therein, in respect it would not have leasure to hear all the single Tones distinctly.

These things thus explained, we are not to omit, that in these Tunes Dissonances are frequently used instead of Consonances; which is effected two wayes, viz. by  
Diminution



Diminution, or Syncope.

1. *Diminution* is when against one Note of one part, are set 2. or 4. or more in another ; in which this order ought to be kept, that the First make a Consonance with a Note of another part, but the Second, if it be only one Degree distant from the former , may make a Dissonance, and also be, by a Tritone, or Fifth fals, distant from another part, because then it seems there set only by accident : and as a way , by which wee may come from a First Note to a Third , with which that First Note ought to make a Consonance , as also doth the Note of the opposite part. But , if that Second Note incede *per Saltus* , i. e. bee distant by the intervall of one Consonance from the First ; then ought it to make a Consonance also with the opposite part : for the former reason ceaseth. But then a Third Note may make a Dissonance if it be moved by Degrees ; of which let this be an Example.

*Superius.* *Synco. p.*

*Bassus* *Exemplum.*

G 3 A



A *Syncopa* is, when the end of one Note in one voice is heard at the same time with the beginning of one other Note of an advers part; as may bee seene in the Example set, where the last time of the Note *B*, is dissonant with the beginning of the Note *C*, which is therefore brought in, because there is yet remaining in the eares the recordation of the Note *A*, with which it made a Consonance; and so *B* bears it selfe to *C*, only as a Relative voyce, in which the Dissonances are carryed through: yea, the Variety of these doth cause, that the Consonances, among which they are set, are heard more distinctly, and also excite the more constant attention. For, when the Dissonance *B C* is heard, the expectation of the eare is encreased, and the judgement of the sweetnesse of the Symphony somewhat suspended, untill the Tune shall arrive at the Note *D*, in which it more satisfies the Hearing; and yet more perfectly in the Note *E*, with which, after the end of the Note *D*, hath kept up the attention, the Note *F*, instantly supervenient doth make an exquisite Consonance, for it is an Eighth [71]. And, indeed, therefore are these Consonances used in Cadences; because what hath been the longer expected, doth the more please when it comes: and therefore the sound, after a Dissonance heard, doth better acquiesce in a most perfect Consonance, or Unison. But heere Degrees are to be set betwixt Dissonances: for whatever is not a Consonance, ought to be accounted a Dissonance.

[71]

Moreover, wee are to observe, that the Hearing is more satisfied in the end by a Eighth, than by a Fifth, and best of all by an Unison; not because a Fifth is not gratefull to the eare, as to the reason of Consonance: but



but because in the end we are to regard Quiet, which is found greater in those sounds, betwixt which is lesse difference, or none at all, as in a Unison. Now this Quiet, or Cadence is delectable not only in the end: but also in the middle the avoidance of this Cadence introduceth no small delight; namely, when one part seems willing to quiesce, and another proceeds on. And this is a kinde of Figure in Musick, such as are Rhetoricall Figures in Oration, of which sort are *Consequence*, *Imitation*, &c. which are effected, when either two parts successively, *i. e.* at divers times, sing wholly the same, or a quite Contrary, which at last they are wont to doe. And truely this, in certain parts of a Tune, doth sometimes much advantage Musick; but as for those artificiall *Counter-poynts*, as they call them; in such Compositions where that Artifice is observed perpetually from the beginning to the end: we conceive, they may belong not more to Musick, than *Acrosticks*, or retrograde Verses to Poesie, which was invented to charm the mind into respective passions, as well as Musick.

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## C H A P. XIII.

## Of Modes.

**F**Requent it is among Practitioners to treat of these Modes, and what they are, all well know; therefore would it be superfluous here to insist thereon: wee shall observe only, that they have their originall from hence, that an Eighth is not divided into equall Degrees, for one while a Tone, another while a Semi-  
tone



tone is found therein : and besides , from a Fifth , because that of all others is most acceptable to the eare , and every Tune seemes to bee composed for the sake of this alone : for an Eighth can be divided into Degrees ,  
 [72] onely seven different wayes [72] , every one of which  
 [73] may bee againe divided by a Fifth two wayes [73] , except  
 [74] Two [74] ; in one of which is found a Fifth false  
 [75] in place of a Fifth [75] , whence there ariseth onely  
 [76] twelve Modes , of which foure are lesse elegant , for this  
 cause , that a Tritone is found in their Fifths [76] , so as  
 they cannot , from a Fifth principall , and for whose sake  
 the whole Tune seems composed , ascend or descend by  
 Degrees , but of necessity there must occur a false Relation  
 of a Tritone , or a Fifth false .

In every Mode , are three principall Termes , from  
 which all Tunes ought to bee begun , and most chiefly  
 [77] concluded [77] , as all Musicians know : and they are  
 called Modes as well from hence , that they restrain the  
 Tune , least the parts of it ramble beyond mediocrity to  
 excesse ; as from hence chiefly , because they are apt to  
 containe various Tunes , which may diversly affect the  
 minde according to the variety of Modes ; of which  
 many things have been sayd by Practisers , taught onely  
 by experience , the reasons of all which may be deduced  
 from our precedent discourse : for , certaine it is , that in  
 some many Ditones , or Thirds *minors* , and in places  
 more or lesse principall , are found , from which almost  
 all the variety of Musick doth arise , as hath beene formerly  
 proved . Again , as much may be sayd of Degrees  
 themselves ; for a Tone *major* is the First , and comes  
 nearest to Consonances , and is *per se* generated from the  
 [78] Division of a Ditone ; but all others *per Accidens* [78] ,  
 from

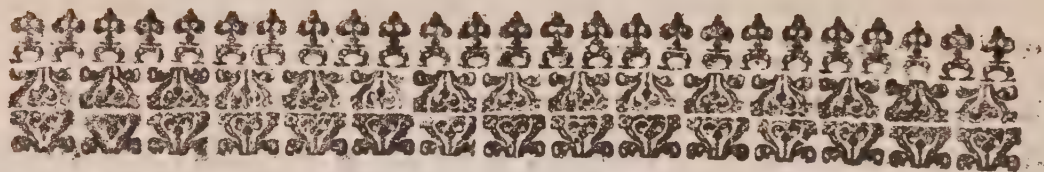


from which and the like, many things concerning the nature of Moods might bee deduced, if a *Compendium* would permit. And heere it should follow, that wee should discourse of all the motions of the minde, which may bee excited by Musick, and in a singular Treatise shew, by what Degrees, Consonances, Times, &c. those motions ought to bee excited: but I should bee unconstant to my purpose of writing an Epitome.

I now discover Land, hasten a shoare, and omit many things for brevity, many by oblivion, but more by ignorance. However, I suffer this issue of my braine, so inform, and lately brought forth rude as a Bears Cub, to venture abroad into your presence: that it may remain as a Monument of our Familiarity, and a most certain memoriall of my love of you: yet, if you please, upon this condition, that, being confined to the secrecie of your Closet, it bee not exposed to the Judicature of others, who may not (as I trust you will) avert their benevolous eyes from the maimed, and defective parts of this Exercise, upon those others, in which I deny not but I have expressed some Lineaments of my Ingenie to the life; nor would they know that this *Compendium* was composed for your sake alone, by one who could not obtain Privacy in an Army, nor leasure in a Throng of other Cares and Affairs.

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- I. **I**ntroduction.
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  - III. **I**f the Number, or Time to be observed in Musickall sounds.
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  - X. Of Degrees, or Tones Musickall.
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  - XIII. Of Modes, alias Moods.
- 

FINIS.



ANIMADVERSIONS  
UPON THE  
Musick-Compendium  
OF  
RENAT. DES-CARTES.

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L O N D O N,

Printed by Thomas Harper, for Humphrey Moseley, and  
are to be sold at his Shop at the Sign of the Prin-  
ces Armes in S. Pauls Church-Yard. 1653.



ON

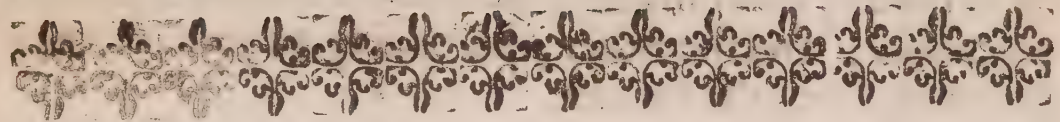
Minick-Competition

A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z.



Printed by J. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z.





# Animadversions upon the Musick-Compendium of R. Des-Cartes.

In these Sablequent Animadversions, brevitatis gratia,

I Characterize

Ratio, or Side	_____
Addition, or more	_____
Subduction, or lesse	_____
Equalitie	_____
Aggregate, or Sum	_____
Excesse, or Difference	_____
Lower, or Graver	_____
Lower, or Graver Term	_____
Higher, or Acuter	_____
Higher, or Acuter Term	_____
Ration	_____
Equality of Ration, or proportionall	_____
Continued Proportion	_____
Multipliyer, or multiplyed by	_____
Divisor, or divided by	_____
Product	_____
Quotient	_____
Potestas	_____
Logarithme	_____

thus;

✓
+
-
=
Z
X.
▽
▽
△
△
R
::
::
m
□
π
□
2
3



And, *distinctionis causa*, I denominate the first Note or Term of any Consonance, or other Musickall Intervall, an *Unison*; and the other, according to its difference, in sound, from the former.

[1] *Audible Differences are as visible Rations*: For Sounds cannot bee distinguished, or their Differences known otherwise than by their mutuall habitude. understand me as thus: The *Sounds* of strings are according to their *Rations*, not visible *Differences*: for Example, as these three Chords have  $a \text{ --- } 1. \text{ Unison.}$   
an equality of *Rations*: (for  $b \text{ --- } 1. \text{ Eighth R.}$   
 $a.b :: b.c.$ ) so their *Sounds*  $c \text{ --- } 4. \text{ Fifteenth R.}$   
(an *Unison*, *Eighth*, and  
*Fifteenth*) have an equality of *Differences*. (For  $1+7 = 8$ ,  
and  $8+7 = 15$ .) And as these  $d \text{ --- } 1. \text{ Unison.}$   
three Chords have an inequality  $e \text{ --- } 3. \text{ Fifth.}$   
of *Rations*: (though an equality  $f \text{ --- } 4. \text{ Eighth R.}$   
of *Differences* visible; for  
 $d+g = e$ , and  $e+g = f$ .) so their *Sounds* (an *Unison*,  
*Fifth*, and *Eighth*) have an inequality of *Differences* aud-  
ible. For as the *Ration* of  $d$  to  $e$ , is  $\frac{2}{3}$ : (and  $\frac{2}{3}$  is a *Fifth*,  
by Fig. first, p. 10.) so the difference of an *Unison* and a  
*Fifth* is a *Fifth*. ( $1+4 = 5$ .) and as *R.* of  $e$  to  $f$  is  $\frac{3}{4}$ : (and  
 $\frac{3}{4}$  is a *Fourth* by Fig. first, p. 10.) so the difference of a  
*Fifth* and an *Eighth* is a *Fourth*. ( $5+3 = 8$ .) And (there-  
fore) Sounds, thus numbred, are as it were imper-  
fect (because not equally distant) audible Indices,  
or Logarithms of their Chords. Here the Reader may  
observe that for the Difference of an *Eighth*, I have ad-  
ded



ded only seven; of a Fifth, four; and of a Fourth, three: and the reason is, because the exclusive account is alwayes one lesse than the inclusive, as is made visible *Animad.* 8.

[2] *Viz. Arithmeticall.* Whereof on strings are two sorts; one *audible*, the other *visible*; but, as to their measure, the *Last* only is properly called *Arithmeticall*; the *first* *Rationall*, or *Geometricall*.

[3] Note there are in *Sounds* two *Proportions*, and *Progressions*, as well as in *Lines* and *Numbers*; *viz.* the *Arithmeticall*, as Second, Third, and Fourth: for  $2 - 1 = 3 - 2 = 1$ : and the *Geometricall*, as Second, Third, and Fifth: for  $1. 2 :: 2. 4$ . And note also, as was sayd before *Animad.* First: That when *Strings* are *audibly* in an *Arithmeticall* proportion, or progression, they then are *visibly* in a *Geometricall*; whence I infer that *Chords*, as to *Sounds*, ought to be Geometrically divided, not Arithmetically; because, so divided, the sence of hearing has not so much to advertise; the audible Differences being alwayes equal, &c. whereof more, after *Anim.* 78, P. 1.

[4]  $\sqrt{8} = 2.828+$ , therefore is  $\begin{cases} a b = 0.828+ \\ b c = 1.172- \end{cases}$

[5] *Viz.* 0.8.

[6] *Viz.* 1.2.

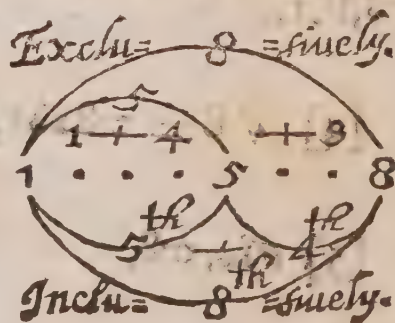
[7] The Notes, or Markes of Time, in Musick are thus Named,



Named, a	Large	Formed,	Valued.
	Long		
	Briefe		
	Semibriefe		
	Minim		
	Crotchet		
	Quaver		
	Semiquaver		

But note these Markes are found otherwise valued sometimes; as when a Large doth comprehend three Longs, a Long three Briefes, &c. according to their severall Moods; or Moods, Times, and Prolations: For satisfaction wherein, as in all things else practically in Musick, not necessary to be known, as to the understanding of this *Compendium*, the Reader is referred to *Harmonicon Mersenni*, *Musurgia Kercheri*, *Morleys Introduction*, &c.

[8] That is, is Four or Seven Notes higher: For the Fifth is the Fourth from the First, and the Eighth is the Seventh, &c. The knowledge of which Notes, together with all other Consonances, and Musically Intervalls (some few excepted, not now in use,) may be, without difficulty, obtained by inspection on the first Figure following.



Whercof



Whereof the *Space* from the *Bridge* to the *Natt*, is understood to be divided into 540, or 10.000 equall parts: the Number of which parts (accounting from the Bridge) to each actuall division of the foure Chords, or Strings, numbred at the Bridge 1, 2, 3, 4; is to be found on the Right hand. The first (B 0) presents you all the Intervalls under an *Eighth*; and their proportions, names, and differences by paralell entrance thence towards the Right hand. and is thus to be read: viz. B 0 [540, or 10.000], is to B 1 [518.4, or 9.600], as 25, to 24: as an *Unison*, to its Acuter *Semitone minus*: B 0 [540, or 10.000]. B 2 [506.25, or 9.375] :: 16.15 :: *Unison*.  $\Delta$  *Sem. major*: B 21 [270, or 5.000]. B 20 [281.25, or 5.208  $\frac{1}{3}$ ] :: 24.25 :: *Unison*.  $\nabla$  *Sem. minor*: B 21 [270, or 5.000]. B 19 [288, or 5.333  $\frac{1}{3}$ ] :: 15.16 :: *Unison*.  $\nabla$  *Semit. major*: The *Habitude*, or Proportion of B 1, to B 2; or of B 2, to B 1: or the difference of a *Semitone minor*, and *major*; or of a *Seventh major*, and *Semi-Eighth*; is a *Diesis minor*, &c. Hence it appeareth that B 0, if struck, when stop'd at 1, doth sound a *Semitone minor* more acute, than it doth, if struck, when unstop'd or open: and that a *Semitone minor* (as 01) is equall to  $\frac{1}{25}$  of the  $\nabla$ , and is substracted from it; and  $\frac{1}{14}$  of the  $\Delta$ , and is added to it. And the like (*mutatis mutandis*) in all the Rest.

The *Secunda Chord* (VF) is divided according to b flat: the *Third* (LF) according to p shape: both, from F to F, as in the Scale, P. 41. And the *Fourth* (W A,) as these, and the like *Instruments*, are usually fretted.

Thus having all the *Intervalls* under an *Eighth*, those above are easily known: for they are all compounded either of one, or more *Eighths* only; as the *Fifteenth*, Two & twentieth, Nine and twentieth, &c. or else of one, or more *Eighths*, and some one of these. And (therefore) as B 0 was divided, to make the first seven Notes after, or above the *Unison*, so is B 21 understood be divided, to make the seven next after, or above the *Diapason*, &c. *ad infinitum*.



# Animadversions upon the Their Proportions, Denominations,

Fig. 1.

			540. or.	10.000	is to	as to	as an Unison, to its acuter
A	ut	1	518.4	9.600	25	24	Semitone minor; or Diesis major
B	re	2	506.25	9.375	16	15	Semitone major; or Degree minor
C	mi	3	486	8.000	8	8	Tone or second minor; or degree major
		4	480	8.888 $\frac{8}{9}$	9	8	Tone or second major; or degree maxim
D	fa	5	455.625	8.437 $\frac{1}{2}$	32	27	Third minor — Schisme
		6	450	8.333 $\frac{1}{3}$	6	5	Third minor; or Semiditone
E	sol	7	432	8.000	5	4	Third major; or Ditone
F	la	8	405	7.500	4	3	Fourth, or Tessaron
		9	400	7.407 $\frac{11}{27}$	27	20	Fourth + Schisme
G	si	10	384	7.111 $\frac{1}{3}$	45	32	Tritone
		11	379.6875	7.031 $\frac{9}{4}$	64	45	Semififth
H	do	12	364.5	6.750	40	27	Fifth — Schisme
		13	360	6.666 $\frac{2}{3}$	3	2	Fifth; or Diapente
I	re	14	337.5	6.250	8	5	Sixth minor; or diapente + Semit. major
K	mi	15	324	6.000	5	3	Sixth major; or diapente + Tone minor
		16	320	5.925 $\frac{24}{25}$	25	16	Diapente + Tone major
		17	303.75	5.625	16	9	Seventh minor; or Diapason — Tone major
		18	300	5.555 $\frac{5}{9}$	9	5	Seventh minor; or Diapason — Tone minor
		19	288	5.333 $\frac{1}{3}$	15	8	Seventh major; or Diapason — Semitone major
		20	281.25	5.208 $\frac{1}{5}$	48	25	Semi-eighth
J	fa	21	270. or	5.000	15	2	Eighth or Diapason

Their propor:

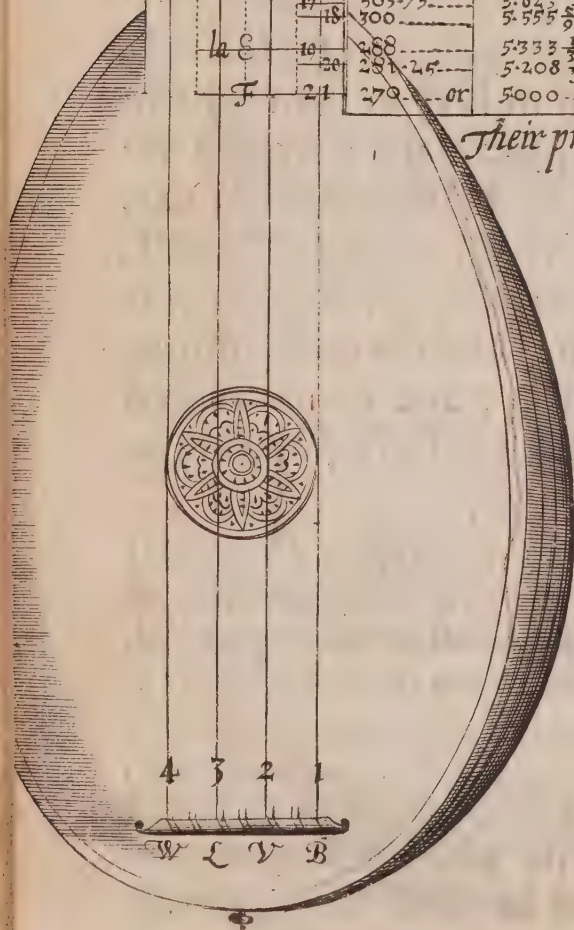
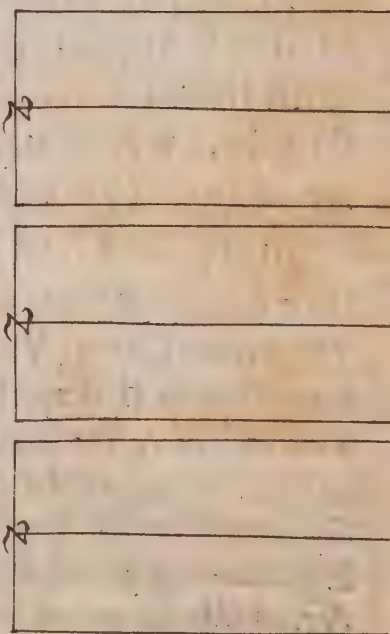


Fig. 2.

Fig. 3.

Fig. 4.





# Musick-Compendium of R. des-Cartes

67

## Differences.

1	2	Eighth, or Diapason	Semitone minor, <sup>or</sup> Diesis major, or Chromatica.
25	48	Semi-Eighth	Diesis minor, or Enharmonica. as 128. to 125. Δ.
8	15	Seuenth major	Semitone minor.
5	9	Seuenth minor	Schisme i.e. as 81. to 80. Δ. as 80. to 81. ∇.
5	16	Seuenth minime	Semitone, or Limma Pythag. as 243 to 256. ∇.
16	27	Fifth + Secand major	Schisme, or Comma majus.
3	5	Sixth major	Semitone minor.
5	8	Sixth minor	Semitone major.
2	3	Fifth	Schisme.
27	40	Fifth - Schisme	Semitone minor.
45	64	Semififth	Comma minus i.e. as 2048. to 2025. Δ.
32	45	Tritone	Schisme.
20	27	Fourth + Schisme	Semitone minor.
3	4	Fourth	Schisme.
4	5	Third major	Semitone maior.
5	6	Third minor	Semitone minor.
27	32	Third minor - Schisme	Schisme.
8	9	Tone major	Semitone pythag. as 256. to 243. Δ.
9	10	Secod minor	Schisme.
15	16	Semitone major	Semitone minor.
24	25	Semitone minor	Diesis minor.
45	to	as an Unisone, to its graver.	Semitone minor.

tions, Denominations, Differences.

540	410-000	540	410-000	540	410-000
510.3	B 9.450	509.7	B 9.459	509.2	B 9.429
482.2	E 8.929	481.1	E 8.909	480.1	E 8.891
455.7	D 8.458	454.1	D 8.409	452.7	D 8.384
430.6	C 7.974	428.6	C 7.957	426.9	C 7.905
406.9	F 7.535	404.5	F 7.492	402.5	F 7.454
384.5	G 7.120	381.8	G 7.071	379.6	G 7.029
363.3	A 6.728	360.4	A 6.674	357.9	A 6.628
343.3	B 6.358	340.2	B 6.300	337.5	B 6.250
324.4	C 6.008	321.1	C 5.946	318.2	C 5.895
306.6	E 5.677	303.1	E 5.612	300.1	E 5.557
289.7	M 5.365	286.1	M 5.297	282.9	M 5.240
273.7	F 5.069	270.0	F 5.000	266.8	F 4.941
258.7	D 4.790			251.6	D 4.659
244.9	P 4.527			237.2	P 4.395
231.0	Q 4.278			225.7	Q 4.142
218.3	R 4.042				
206.3	S 3.820				



# Animadversions upon the

[9] Yet, in his Second figure p. 13, <sup>e</sup> Author set's downe some Consonances with greater Differences; and page. 14. he dichotomiseth A.B into eight parts for the Consonances, as into 16 for both Tones.

[10] But more clearly this fig: following, where the Space A.B is actually and distinctly divided into 2, 3, 4, 5, & 6, equall parts.

A	2	Eighth				1	B				
	3	Fifth	2	Eighth		1					
	4	Twelfth				1					
	5	Fourth	3	Fifth	2	Eighth					
	6	Eighth				1					
	7	Fifteenth				1					
	C	8	Third ma:	4	Fourth	3	Fifth	Eighth			
		9	Sixth major				2				
		10	Tenth major				1				
		11	Seventeenth major				1				
		12	Third mi:	4	Third ma:	4	Fourth	Fifth	Eighth		
		13	Fifth				3				
14		Eighth				2					
15		Twelfth				1					
16		Nineteenth				1					
17		450	405	360	324	270	216	180	135	108	90
18		450	405	360	324	270	216	180	135	108	90
D		19	450	405	360	324	270	216	180	135	108
	20	450	405	360	324	270	216	180	135	108	90
	21	450	405	360	324	270	216	180	135	108	90
	22	450	405	360	324	270	216	180	135	108	90
	23	450	405	360	324	270	216	180	135	108	90
	24	450	405	360	324	270	216	180	135	108	90
	25	450	405	360	324	270	216	180	135	108	90
	26	450	405	360	324	270	216	180	135	108	90
	27	450	405	360	324	270	216	180	135	108	90
	28	450	405	360	324	270	216	180	135	108	90
	29	450	405	360	324	270	216	180	135	108	90
	30	450	405	360	324	270	216	180	135	108	90
E	31	450	405	360	324	270	216	180	135	108	90
	32	450	405	360	324	270	216	180	135	108	90
	33	450	405	360	324	270	216	180	135	108	90
	34	450	405	360	324	270	216	180	135	108	90
	35	450	405	360	324	270	216	180	135	108	90
	36	450	405	360	324	270	216	180	135	108	90
	37	450	405	360	324	270	216	180	135	108	90
	38	450	405	360	324	270	216	180	135	108	90
	39	450	405	360	324	270	216	180	135	108	90
	40	450	405	360	324	270	216	180	135	108	90
	41	450	405	360	324	270	216	180	135	108	90
	42	450	405	360	324	270	216	180	135	108	90
F	43	450	405	360	324	270	216	180	135	108	90
	44	450	405	360	324	270	216	180	135	108	90
	45	450	405	360	324	270	216	180	135	108	90
	46	450	405	360	324	270	216	180	135	108	90
	47	450	405	360	324	270	216	180	135	108	90
	48	450	405	360	324	270	216	180	135	108	90
	49	450	405	360	324	270	216	180	135	108	90
	50	450	405	360	324	270	216	180	135	108	90
	51	450	405	360	324	270	216	180	135	108	90
	52	450	405	360	324	270	216	180	135	108	90
	53	450	405	360	324	270	216	180	135	108	90
	54	450	405	360	324	270	216	180	135	108	90
G	55	450	405	360	324	270	216	180	135	108	90
	56	450	405	360	324	270	216	180	135	108	90
	57	450	405	360	324	270	216	180	135	108	90
	58	450	405	360	324	270	216	180	135	108	90
	59	450	405	360	324	270	216	180	135	108	90
	60	450	405	360	324	270	216	180	135	108	90
	61	450	405	360	324	270	216	180	135	108	90
	62	450	405	360	324	270	216	180	135	108	90
	63	450	405	360	324	270	216	180	135	108	90
	64	450	405	360	324	270	216	180	135	108	90
	65	450	405	360	324	270	216	180	135	108	90
	66	450	405	360	324	270	216	180	135	108	90
H	67	450	405	360	324	270	216	180	135	108	90
	68	450	405	360	324	270	216	180	135	108	90
	69	450	405	360	324	270	216	180	135	108	90
	70	450	405	360	324	270	216	180	135	108	90
	71	450	405	360	324	270	216	180	135	108	90
	72	450	405	360	324	270	216	180	135	108	90
	73	450	405	360	324	270	216	180	135	108	90
	74	450	405	360	324	270	216	180	135	108	90
	75	450	405	360	324	270	216	180	135	108	90
	76	450	405	360	324	270	216	180	135	108	90
	77	450	405	360	324	270	216	180	135	108	90
	78	450	405	360	324	270	216	180	135	108	90
I	79	450	405	360	324	270	216	180	135	108	90
	80	450	405	360	324	270	216	180	135	108	90
	81	450	405	360	324	270	216	180	135	108	90
	82	450	405	360	324	270	216	180	135	108	90
	83	450	405	360	324	270	216	180	135	108	90
	84	450	405	360	324	270	216	180	135	108	90
	85	450	405	360	324	270	216	180	135	108	90
	86	450	405	360	324	270	216	180	135	108	90
	87	450	405	360	324	270	216	180	135	108	90
	88	450	405	360	324	270	216	180	135	108	90
	89	450	405	360	324	270	216	180	135	108	90
	90	450	405	360	324	270	216	180	135	108	90
J	91	450	405	360	324	270	216	180	135	108	90
	92	450	405	360	324	270	216	180	135	108	90
	93	450	405	360	324	270	216	180	135	108	90
	94	450	405	360	324	270	216	180	135	108	90
	95	450	405	360	324	270	216	180	135	108	90
	96	450	405	360	324	270	216	180	135	108	90
	97	450	405	360	324	270	216	180	135	108	90
	98	450	405	360	324	270	216	180	135	108	90
	99	450	405	360	324	270	216	180	135	108	90
	100	450	405	360	324	270	216	180	135	108	90
	101	450	405	360	324	270	216	180	135	108	90
	102	450	405	360	324	270	216	180	135	108	90
K	103	450	405	360	324	270	216	180	135	108	90
	104	450	405	360	324	270	216	180	135	108	90
	105	450	405	360	324	270	216	180	135	108	90
	106	450	405	360	324	270	216	180	135	108	90
	107	450	405	360	324	270	216	180	135	108	90
	108	450	405	360	324	270	216	180	135	108	90
	109	450	405	360	324	270	216	180	135	108	90
	110	450	405	360	324	270	216	180	135	108	90
	111	450	405	360	324	270	216	180	135	108	90
	112	450	405	360	324	270	216	180	135	108	90
	113	450	405	360	324	270	216	180	135	108	90
	114	450	405	360	324	270	216	180	135	108	90
L	115	450	405	360	324	270	216	180	135	108	90
	116	450	405	360	324	270	216	180	135	108	90
	117	450	405	360	324	270	216	180	135	108	90
	118	450	405	360	324	270	216	180	135	108	90
	119	450	405	360	324	270	216	180	135	108	90
	120	450	405	360	324	270	216	180	135	108	90
	121	450	405	360	324	270	216	180	135	108	90
	122	450	405	360	324	270	216	180	135	108	90
	123	450	405	360	324	270	216	180	135	108	90
	124	450	405	360	324	270	216	180	135	108	90
	125	450	405	360	324	270	216	180	135	108	90
	126	450	405	360	324	270	216	180	135	108	90
M	127	450	405	360	324	270	216	180	135	108	90
	128	450	405	360	324	270	216	180	135	108	90
	129	450	405	360	324	270	216	180	135	108	90
	130	450	405	360	324	270	216	180	135	108	90
	131	450	405	360	324	270	216	180	135	108	90
	132	450	405	360	324	270	216	180	135	108	90
	133	450	405	360	324	270	216	180	135	108	90
	134	450	405	360	324	270	216	180	135	108	90
	135	450	405	360	324	270	216	180	135	108	90
	136	450	405	360	324	270	216	180	135	108	90
	137	450	405	360	324	270	216	180	135	108	90
	138	450	405	360	324	270	216	180	135	108	90
N	139	450	405	360	324	270	216	180	135	108	90
	140	450	405	360	324	270	216	180	135	108	90
	141	450	405	360	324	270	216	180	135	108	90
	142	450	405	360	324	270	216	180	135	108	90
	143	450	405	360	324	270	216	180	135	108	90
	144	450	405	360	324	270	216	180	135	108	90
	145	450	405	360	324	270	216	180	135	108	90
	146	450	405	360	324	270	216	180	135	108	90
	147	450									

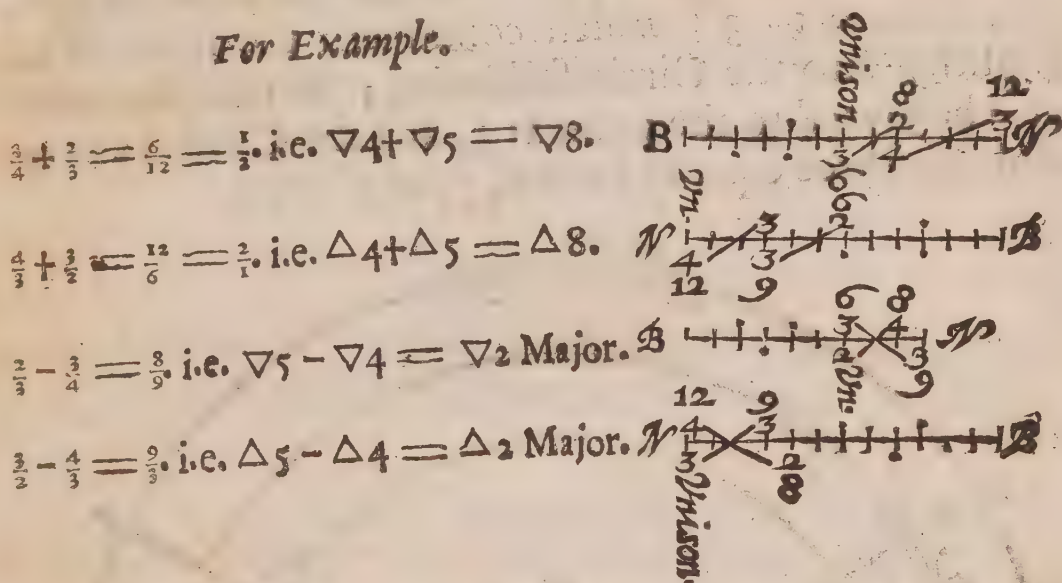


their *Rations*, and Divisions by Subduction : viz.

Addition, by a Multiplication of the *like* Terms, or Collaterally thus = :

Subtraction by a Multiplication of the *unlike* Terms, or obliquely thus X :

For Example.



as is visible from the divisions on the four Chordes adjoining.

[12.] As may be seen in Fig. An. 10.

[13.] That is, the double of the lesser Term, with the greater, giveth the excess thereof above an *Eighth*, viz. if the Intervall exceedeth not a *Fifteenth*: but if they be further distant than a *Fifteenth*, yet not exceeding a *Two and twentieth*, than two *Eights* is to be added to the lesser Term; i. e. it must be multiplied by four: &c.

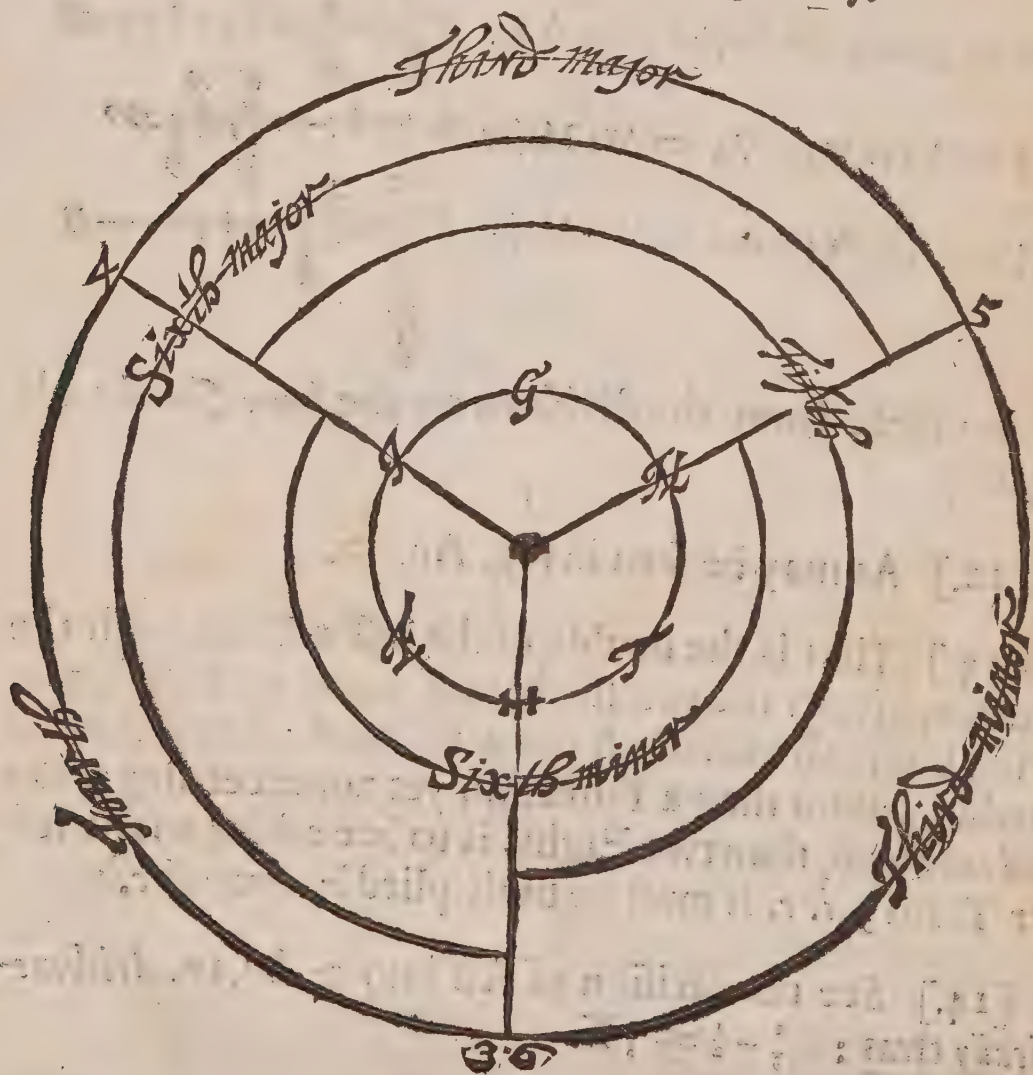
[14.] See the division of AB into 3: An. 10. Arithmetically thus:  $\frac{1}{3} - \frac{1}{3} = \frac{1}{3}$  X.



[15.] *Viz.* for the graver Term. See the division of AB into 4. An. 10.

[16.] For  $\frac{1}{2} + \frac{1}{2} = 1$ .

[17.] *Viz.* p. 9. And may be made out from the division of AB into six An. 10, if according to the method of our Authour, p. 17, we convert one halfe thereof, *viz.* from 6 to 3 (which containeth the space of an Eighth) into the Circle following; so that the point at 6 be joyned to the point at 3, and the Circle be divided into three equally (as is 6, 3) at 4 and 5.





[18.] As  $\frac{1}{2} - \frac{4}{5} = \frac{3}{10}$  X.

[19.] Or composed of one, or more *Eights* only, or together with some one that is contained therein. p. 11.

[20.] As, in Fig. 1, An. 8, is the *Eighth* on the *Chorde* B o; viz. o 21 at 8.

[21.] As, on the same *Chorde*, is 8 21 at 14.

[22.] As, on the same *Chorde*, is 14 21 at 17.

[23.] It should have been only the *Semitone major*; for the *Semitone minor* is not to be found without an other Subdivision.

[24.] Viz. An *Eighth*; from the first division of AB, p. 14: a *Fifth*; from the Second: and a *Ditone* from the Third.

[25.] 2 gives the *Eight*; 3 the *Fifth*; and 5 the *Third major*: see also A B An. 10.

[26.] Here endeth the *Former Treat*, as it's called, p. 27, l. 25.

[27.] Whereof p. 55.

[28.] By *Numbers*; as in the first Fig. 10. by *Division*; as of the line A B, p. 14.

[29.] Viz. the *Eighth*, *Fifth*, and *Ditone* as before.

[30.] Viz. p. 11.

[31.] For both the compounded *Ditones*, as well as the simple, are to be found on a *Chorde* understood to consist



first of but five equall parts; whereas the first compound *Fourth* requireth 8, and the Second 16; as in the Second Fig. p. 13.

[32.] Proportion is called *Multiplex*; when the greater Terme containeth the lesser exactly twice, or oftner: *Superparticular*; when the greater containeth the lesser once, and one certain part thereof: and *Multiplex-superparticular*; when the greater doth containe the lesser twice or oftner, and (besides) one certain part thereof.

[33.] For, as an *Eighth*, divided equally into two parts, doth constitute properly a *Fifth*, and by accident a *Fourth*; so that *Fifth* divided into two equall parts, constituteth properly a *Ditone*, and by accident a *Third minor*: see AB Animad. 10.

[34.] For a *Ditone* + *Fourth* = *Sixth major*; a *Ditone* + an *Eighth* = *Tenth major*; and a *Ditone* + *Fifteenth* = *Seventeenth major*. See Fig. 1, p. 10, at Numbers 4 and 5; and the division of AB into 5 Fig. An. 10.

[35.] For a *Third minor* + a *Fourth* = *Sixth minor*.

$$\frac{5}{6} + \frac{1}{4} = \frac{5}{8}$$

[36.] *Viz.* of the Graver Term. See Fig. AB An. 10.

[37.] Note, that in every Muscicall *Systeme*, (whereof there are two sorts; the greater of Ten paralell Lines, and the lesser of Five:) every Line is the seat of one Note, and every intervall of another, and therefore C is a Note higher than B, and G lower than E. See p. 40.



[38.] For  $\frac{4}{3} - \frac{2}{3} = \frac{2}{3}$  i. e.  $\frac{1}{6}$  of the Graver Term.

[39.] Viz. p. 14, where CB, the space of an Eight, is divided into CE a Ditone; ED a Third *minor*; and DB a Fourth.

[40.] Viz. by dividing CE p. 14, equally into Two, at F: or DG, Fig. An. 10. at F: or 14 21 of the Chorde B o, Fig. 1, An. 8, at 17.

[41.] By dividing EG, Fig. An. 10, at F: or 8 14 of the Chorde B o, Fig. 1, An. 8, at 11.

[42.] By dividing GI, Fig. An. 10, at H; or EH at G: or o 8 of the Chord B o, Fig. 1, An. 8, at 6.

[43.] As o 6, Fig. 1, An. 8, at 2.

[44.] As DG = DE, + EF, + FG; Fig. An. 10: or 14 21, = 14 15, + 15 17, + 17 21; of the Chorde B o Fig. 1, An. 8.

[45.] As DE, + EF = DF; Fig. An. 10: or 14 15, + 15 17, = 14 17; of the Chorde B o Fig. 1, An. 8.

[46.] As 14 15, with 11 14; of the Chorde B o Fig. 1, An. 8.

[47.]  $64.75 :: 324.379.6875 :: 6.000.7031 \frac{1}{4}$ .  
 $\frac{24}{25} + \frac{8}{9} = \frac{64}{75}$ . See Fig. 1, An. 8.

[48.] Because a *Semitone majus* makes no *Consonance* with the other two.

K

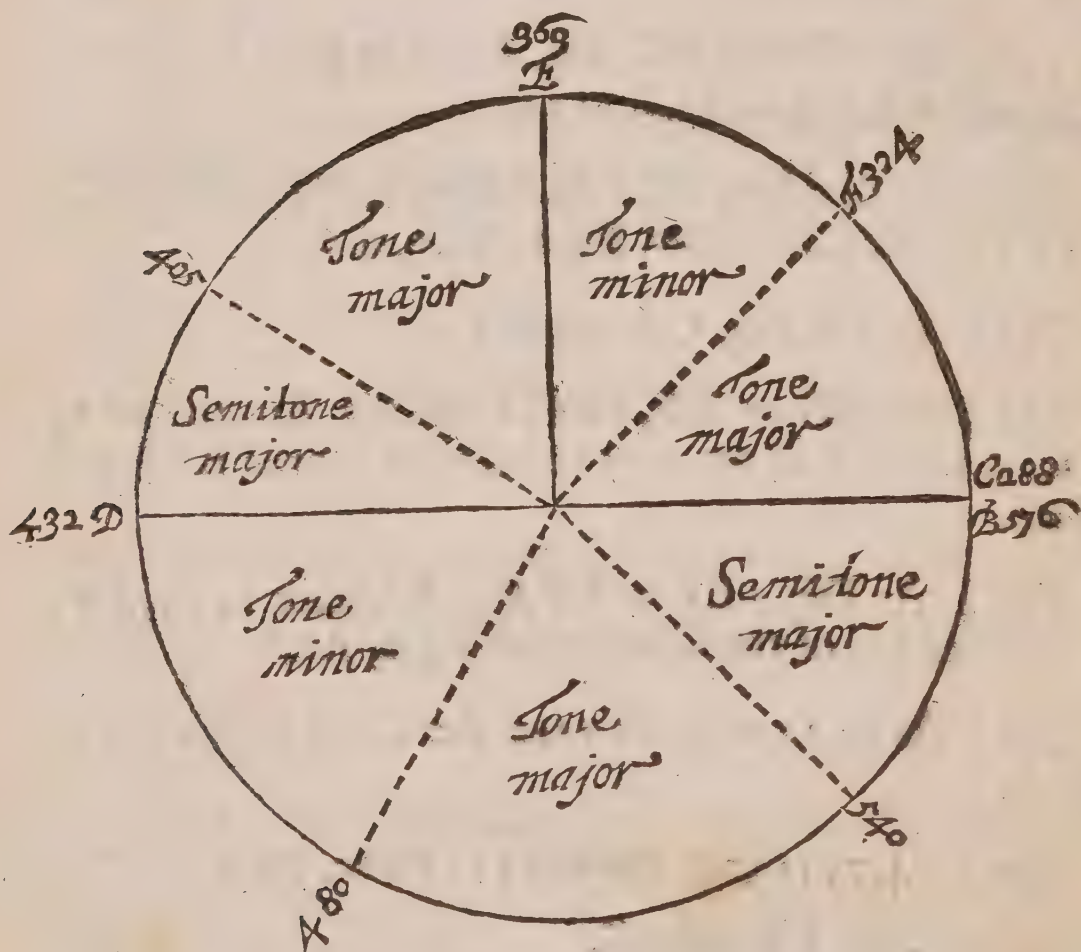
[49.] Be-



[49.] Because a *Tone major* maketh a *Third*, with either.

[50.] *Viz.* p.27.

[51.] For otherwise a *major Semitone*, and *minor Tone* must fall together, as may be seene in this following Figure; where the space of an Eighth is turned into a Circle, and divided first, as was CB p. 14, at D and E; and then subdivided as p.27.



[52.] Others do call it a *Comma majus*, See Fig. 1, An. 8.

[53.] And is called *Semitonium medium*, as Fig. 1, An. 8.

[54.] Or



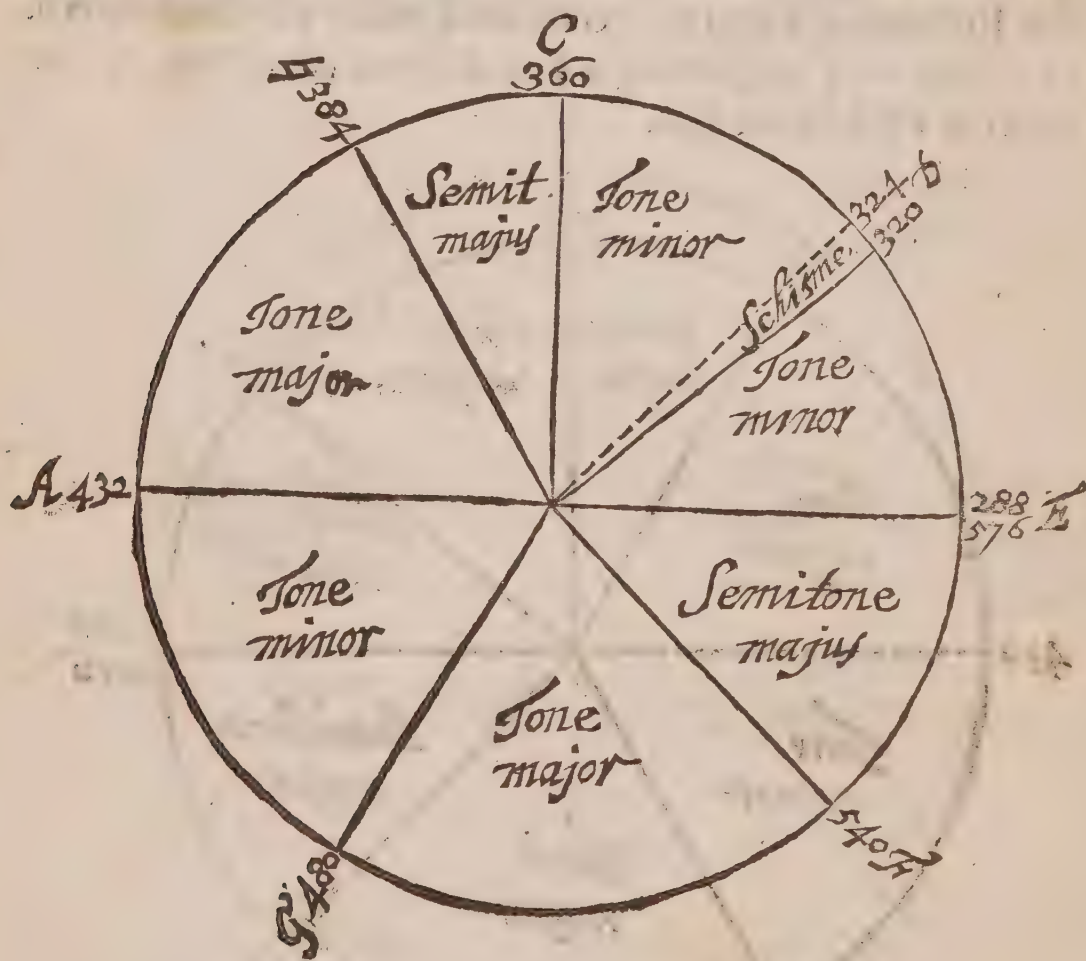
[54.] Or rather 576; because it is the *Gravest Term*, in this instance: as also according to the division of an Eighth, p.14, and 27. See Fig. An.51.

Note that an *Eighth*, divided first into three equall parts, by the division of the whole string into six, as p. 13; and those three then subdivided, as p.28; doth give the Degrees in the same Order: as is to be seen by the following Figure, compared with the former An. 51; this only beginning a *Fourth* from the other, or the other a *Fifth* from this.





[55.] Only it seemeth as moved upon its *Center*, till the *Schisme* cometh to be between 324 and 320, as this Figure doth demonstrate; which differeth not from the last (An. 54): only in this the *Schisme* doth stand divided from the *major* Tone (the Intervall between 320, and 360) in that other.



[56.] Here



[56.] Here the Authour recedeth from his former division of an *Eighth*, onely by removing the *Graver Terme* from E to F : as is to bee seen by these two spaces of an

<i>The First</i>				<i>The Second</i>			
288	360	435	576	288	324	480	576
270	337.5	405	540	270	360	450	540

*Eighth*. The first divided as CB, p.14, at D and E: the Second as CI, Fig. An.10, at DG. with both which this doth accord ; E, not F, being made the *Gravest Terme*.

[57.] For from F (the First Term of the *Voice in b flat* ascending) to C (the first in the *Voice Naturall*) is a Fifth; as also from hence to G, where the *Voice in. p Sharp* be-  
ginneeth.

[58.] For p (B Sharpe) is a *Tritone* more Acute than  $\nabla$  (F being so accounted) : and a *false, or Semi-Fifth*  $\nabla$  than the  $\Delta$ . But placing the *Graver Terme* at E; then is p, a Fifth more Acute than the *Graver Terme*; and a Fourth more Grave than the *Acuter Terme* : and b flat a *Semi-Fifth*  $\Delta$  than  $\nabla$ ; and a *Tritone*  $\nabla$  than  $\Delta$ . See Fig. p.35.

[59.] *Viz.* p.34. For ) : is F:  $\equiv$  is C: and G is G.

[60.] *Viz.* Musickall spaces, i.e. to every *Tone* the greater, and to every *Semitone* the lesser Intervall.

[61.] As appeareth by this Figure following.







	Ninth major		Ninth maxim		Ninth minor
	Seventh minor	Seventh minim			
	Sixth minor		Tone ma. mi. Sem. ma. Tone ma. mi. ma. ma. Sem. ma. Tone ma. mi. ma. ma. Sem. ma.		
		Tone ma. mi. Sem. ma. Tone ma. mi. ma. ma. Sem. ma.			
Tone ma. mi. Sem. ma. Tone ma. mi. ma. ma. Sem. ma.					

[68.]  $480.405 :: 384.324 :: 32.27.$   
 $480.324 :: 40.27.$   
 $324.240 :: 27.20.$   
 $405.240 :: 324.192 :: 27.16.$

[69.] For  $\frac{3}{4} + \frac{128}{135} = \frac{32}{45} : \frac{2}{3} - \frac{128}{135} = \frac{45}{640}$

[70.]  $540.384 :: 405.288 :: 45.32.$   
 $384.270 :: 288.202.5 :: 576.405 :: 64.45.$

[71.] viz. the first compound *Eighth*, i. e. a *Fifteenth*.

[72.] viz. without altering the order of Succession,  
p.30, and 41.

Otherwise, of *Eighths* considered only as consisting of  
three *major* Tones, two *minor* Tones, and two *major* Se-  
mitones;



mitones ; there are 210 severall sorts, or *Moods* ; and  
 maybe found, by the Laws of *Combination*, as in this *Table*  
 following ; where note *a* is put for a *major Tone* ; *b*  
 for a *minor Tone*, and *c* for a *major Semitone*.

a	a	a	b	b	c	c				c	a	b	b	
				c	b	c					b	a	b	
					c	b						b	a	30
			c	b	b	c			b	a	a	b	c	
				c	b	b					c	b	c	
				c	b	b						c	b	
		b	a	b	c	c				b	a	c	c	
			c	b	c						c	a	c	
				c	c	b						c	a	
		b	a	c	c		10			c	a	b	c	
			c	a	c						b	a	c	
			c	a	b	c						c	a	
				c	b						c	a	b	40
			b	a	c							b	a	
				c	a	b			b	a	a	c	c	
				c	a	b				c	a	c		
				b	a	c					c	a	c	
		c	a	b	b	c				c	a	a	c	
			c	b	b		20				c	a	a	
			b	a	b	c				c	a	b	c	
				c	b						c	a	b	
			b	a	c						b	a	c	50
				c	a	b						c	a	
			c	a	b						c	a	b	
				b	a						b	a		







				b	a					c	a	a	a	b	b	c		
				b	a	a	120								c	b		
b	a	a		a	c	c								b	c	b		
				c	a	c									a	b	c	
					c	a									c	b		
		c		a	a	c								b	a	c		
					c	a									c	a		
		c	a	a	a	c									c	a	b	
					c	a									b	a	b	
					c	a									a	b		
					c	a									b	a	b	
					c	a									a	b		
					c	a									c	a		
					c	a									b	a	a	
					c	a									c	a		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
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					c	a									b	a	a	
					c	a									a	b		
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					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
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					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a	a	
					c	a									a	b		
					c	a									b	a		



	b	a	c			c	a	a	a	b	
		c	a						b	a	
			b	a				b	a	a	
	b	a	a	c		c	a	a	a	a	200
		c	a	a				b	a	b	
	c	a	a	b	190			b	a	a	
		b	a	a					b	a	
b	a	a	a	c		b	a	a	a	b	
		c	a	a				b	a	a	
	c	a	a	a				b	a	a	210

After the same Method, there are found twelve *Fifths*, and six *Fourths*, as followeth.

## Fifths

a	a	b	c	1	b	a	a	c	7
		c	b				c	a	
	b	a	c			c	a	a	
		c	a		c	a	a	b	
	c	a	b				b	a	
		b	a	6		b	a	a	12

## Fourth

a	b	c	1
	c	b	2
b	a	c	3
	c	a	4
c	a	b	5
	b	a	6

And therefore of *Eights* divided into *Fourths* and *Fifths*, there are seventy and two severall *Moods*: and thus of *Fifths*, divided into *Thirds*, there are eight *Species*: &c.

[73] Viz. both *Arithmetically*, as 2 3 4, the Fifth be-  
L 2 fore



fore the Fourth ; and *Harmonically*, as 3 4 6, the Fourth before the Fifth, ascending.

[74.] *Viz.* from B to B, *Arithmetically*; and from E to E, *Harmonically*, in *b* flat : or from F to F, *Arithmetically*; and from B to B, *Harmonically*, in  $\sharp$  (B sharp) p. 41.

[75.] *Viz.* from E to E, in *b* flat; or from B to B, in  $\sharp$ . p. 41.

[76.] *Viz.* from F to F, A to <sup>B</sup>~~A~~ to B, and E to E, in *b* flat ; or from C to C, E to E, F to F, and B to B, in  $\sharp$ . p. 41.

[77.] *Viz.* the two Extrems, and the middle Term.

7 8.] See p. 18 and 39.

§ 1. Now considering (as was sayd An. 1 and 3) that not the *visible* proportion of *Chords* or *Strings*, but the *audible* proportion of their *Sounds* only is considerable in Musick ; and that, by the *Sence* of *Hearing*, wee doe judge of *Sounds* according to the *Geometricall*, not *Arithmetical* Proportion, or proportionall *Division* of the *Strings*, that give them : I conceive it was rightly inferred An. 3, that *Chordes*, as to *Sounds*, ought to bee divided according to a *Geometricall*, not *Arithmetical* *Proportion* ; by force of the same *Reason* (adequated to the *Sence* of *Hearing*.) which our *Author* gave for the contrary opinion in his sixth *Preconsiderable*. It therefore remaineth that I heere shew what *Division* it is I mean, and how it may be performed.

§ 2. First then let the Chord AZ, Fig. 2, An. 8, be divided at S, into *Extrem* and *Mean Ratio*; by 30. 6. *Elem. Euclid.* or by *Prob. 1. c. 19. Clavius Mathematica*; which done, let AS, the *Mean Proportionall*, bee divided into 17 equall *Semitones*, by 16 mean *Proportionals*; by the *Letter Table* of



of *Potestates* Chap. 12. of Mr. Oughtred's *Clavis Mathem.*  
or rather (the other way; in this case, being very labori-  
ous) Chap. 17. *Arithmetica Logarithmica* H. Briggs.

§ 3. I perform'd it thus.

$$AZ = B$$

$$AS = A$$

Therefore  $ZS = B - A$

$$B - A. A :: A. B$$

$$Aq = Bq - BA$$

$$Aq + BA = Bq$$

$$Aq + BA + \frac{1}{2} Bq = Bq + \frac{1}{2} Bq$$

$$A + \frac{1}{2} B = \sqrt{Bq + \frac{1}{2} Bq}$$

$$A = \sqrt{Bq + \frac{1}{2} B} - \frac{1}{2} B$$

$$B = 10$$

$$Bq = 100$$

$$\frac{1}{2} Bq = 50$$

$$Bq + \frac{1}{2} Bq = 150$$

$$\sqrt{Bq + \frac{1}{2} Bq} = 11.8033,98875 -$$

$$\frac{1}{2} B = 5$$

$$A = 6.18033,98875 -$$

$$B - A = 3.81966,01125 +$$

$$B = 10.00000,00000 \quad \bar{2} \quad 1,00000,00000$$

$$B - A = 3.81966,01125 \quad \bar{2} \quad 0,58202,47162$$

$$X \quad 0,41797,52838$$

$$\quad 17$$

$$\quad 0,02458,67814 = R \quad 1.058 +$$

$$\bar{2} B - A \quad 0,58202,47162 = ZS \quad 1.820 -$$

$$\quad + ZS \quad 0,60661,14976 \quad ZR \quad 4.042 +$$

$$ZR \quad 0,63119,82790 \quad ZQ \quad 4.78 -$$

$$ZQ \quad 0,65578,50604 \quad ZP \quad 4.57 -$$

$$ZP \quad 0,68037,18418 \quad ZO \quad 4.790 +$$

$$L \quad 3$$

$$\quad + ZO$$



*And the same may be*

5 + ZO	0, 70402, 86332	=	ZM	5'0694
ZN	0, 71954, 14046		ZM	5'165 -
ZM	0, 74413, 21860		ZL	5'677 +
ZL	0, 77871, 89674		ZK	6'008 -
ZK	0, 80330, 57488		ZI	6'358 -
ZI	0, 82789, 25302		ZH	6'718 +
ZH	0, 85247, 93116		ZG	7'120 -
ZG	0, 87706, 60930		ZF	7'535 -
ZF	0, 90165, 28744		ZE	7'94 -
ZE	0, 92623, 96558		ZD	8'438 +
ZD	0, 95082, 64372		ZC	8'9'9 +
ZC	0, 97541, 32186		ZB	9'450 -
ZB	1, 00000, 00000		ZA	10'000

§ 4. Into *Extream and meane Ratio*; that the parts and whole may be  $\div$ . ZS. SA :: SA. ZA.

§ 5. Into *Seventeen equall Semitones*; because (the Ear not well distinguishing smaller Intervalls) this *Number* doth best admit of the subsequent *Divisions*, proportionall to their *Extremes*; whence the *Consonances* doe naturally arise, according to this *Analogy*, viz. As the number of parts in the First Terme, is to the number of parts in the Third; so the number of Ratios between the First and Second, to the number of Ratios between the Second and Third. And may bee work'd by either of the following Rules.

*In Naturall Numbers.*

First Rule.  $\triangle \text{ or } \sqrt{[\frac{\triangle}{\nabla}]} \times [\triangle] R = \text{Second Terme.}$

Second Rule.  $\nabla \text{ or } \sqrt{[\frac{\nabla}{\triangle}]} \times [\nabla] R = \text{Second Terme.}$

*In*



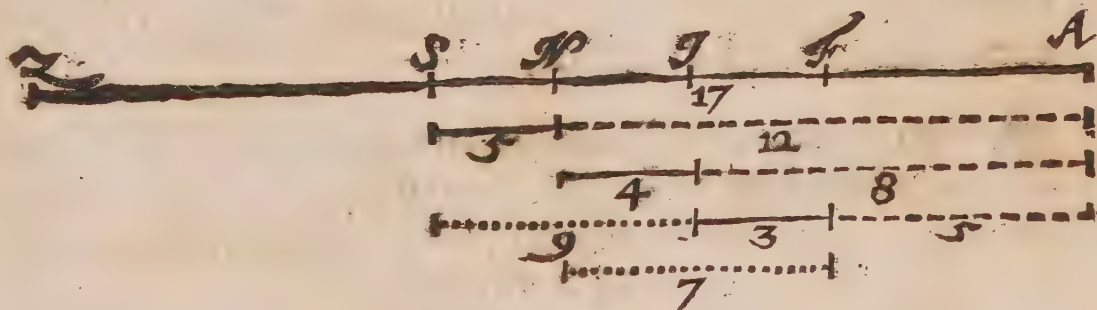
In Artificiall Numbers, or Logarithmes.

First Rule.  $b + \frac{aB - bB}{A + B} = \text{Second Terme.}$

Second Rule.  $a - \frac{aA - bA}{A + B} = \text{Second Terme.}$

Note  $\frac{\Delta}{\nabla} = \nabla + \Delta : A = \nabla : a = \frac{1}{2} \nabla : B = \Delta : b = \frac{1}{2} \Delta$

§ 6. For, from this Division, of the Intervall of an *Eleventh* (i.e. the Meane Proportionall AS); ariseth an *Eighth*, and a *Fourth*: of an *Eighth*; a *Sixth minor*, and a *Third major*: and of a *Sixth minor*; a *Third minor*, and a *Fourth*. and these compounded give the rest.



ZS. ZA :: 5 Semit. 12. fere.

ZN. ZA :: 4. 8. fere.

ZI. ZA :: 3. 5. fere.

Third minor = 3 Semitones.

Third



Third major = 4 Semitones.

Fourth = 5.

Fifth = 7.

Sixth minor = 8.

Sixth major = 9.

Eighth = 12.

*This Proportion or Progression, from its excellency and composition, I call Ratio-harmonicall.*

§ 7. It may bee objected that the R of ZS to ZA is 2° 61803398875 -, that is as 5 to 13 +; and therefore SA ought rather to have been divided into 18 proportionall parts, by 17 Meane Proportionalls: whereof 5 = Intervall of a Fourth; and 13 = Space of an Eighth.

§ 8. To which I answer, that SA is understood to bee divided into 13° 8196601125 + Proportionall parts: (because the R of ZS to ZA, viz. 2° 61803398875 -, is as 3° 81966,01125 + to 10° 00000,00000.) whereof the space of an Eighth containeth 10° 00000,00000; and of a Fourth 3° 81966,01125 +. &c. And may bee easily found (by Logarithmes) working, according to the Second Rule, Par. Fifth, thus.

$$AZ = 10^{\circ} 00000,00000 \quad \bar{2} \quad 1,00000,00000.$$

$$ZS = 3^{\circ} 81966,01125 \quad \bar{2} \quad 0,58202,47162.$$

$$0,41797,52838,000000000000.$$

$$13^{\circ} 8196601125$$

$$0,30244,97566.$$

$$0,69755,02434 = ZN, 4^{\circ} 98368,11082.$$

$$AZ = 10^{\circ} 00000,00000 \quad \bar{2} \quad 1,00000,00000.$$

$$ZN = 4^{\circ} 98368,11082 \quad \bar{2} \quad 0,69755,02434.$$

$$0,30244,97566,000000000000.$$

$$14^{\circ} 9836811082$$

$$0,20185,27720.$$

$$9,79814,72280 = ZI, 6^{\circ} 28271,31146$$

ZA



$$ZA = 10'00000,00000 \sqrt[17]{1,00000,00000.}$$

$$ZI = 6'28271,31146 \sqrt[17]{0.79814,72280.}$$

$$0,20185,27720,000000000000.$$

$$16'2827131146$$

$$0,12396,75296.$$

$$0,87603,24704. = ZF, 7'51679,09302$$

§ 9. But this exactness is not requisite, since the *Sense of Hearing* is not so perfect, as to confine the *Consonances* to so precise a *Measure*; (see p. 46.) and therefore, seeing that SA divided into 17 Proportionall Spaces, doth give (without any *Fraction*, or sensible difference,) all the simple *Consonances*; & that

$$\frac{38'1966+}{100'0000} = \frac{4'7745+}{12'5000}$$

that is, without *Fraction*,  $\frac{1}{12}$ ; as because, if SA be divided into 18 Proportionall *Intervalls*, NA (containing 13 of them) cannot be divided at I without a *Fraction*, much less again at F, I made 17  $\square$  Par. 3. with which the common *Division* doth not ill accord; for so many *Semitones* are contained in an *Eleventh*.

§ 10. Thus then having resolved that the *Proportion* of ZS to ZA is, as to the practick, exactly enough accounted as 5 to 12: It must follow, by force of the preceeding Rules Par. 5. that (1) the *Product* of 3'81966, 01125 Multiplied by the Seventeenth *Roote* of the Fifth *Potestas* of 2'61803398875; or (2) the *Quotient* of 10'00000, 00000 Divided by the Seventeenth *Roote* of the Twelfth *Potestas*, of 2'61803398875 = ZN. And by *Logarithmes* as followeth.

M

ZA



AZ =	10,00000,00000	$\bar{Z}$	1,00000,00000	
ZS =	3,81966,01125	$\bar{Z}$	0,58202,47162	
	X		0,41797,52838	0,41797,52838
	$m^r$		5	12
	$m^r$		2,08987,64190	5,01570,34056
	$\square$		17	17
	$\square$		0,12293,39070	0,29504,13768
	$\bar{Z}, \Delta$		0,58202,47162	$\nabla$ 1,00000,00000
	Z		0,70495,86232	X 0,70495,86232

the *Logarithme* of (ZN) 5.069+. differing from the former, Par. 8, about the *Intervall* of a *Schisme*, or *Comma majus*, no preceptible *Dissonance*, as p. 33.

s 11. Then ZN being to ZA, as 1 to 2 *fere*; therefore, by the Second Rule in Logarithmes, Par. 5.

$\bar{Z}$ ZA	1,00000,00000	
ZN	0,70495,86232	
	0,29504,13768	
	2	
	0,59008,27536	
	3	
	0,19669,42512	
	1,00000,00000	
	0,80330,57488	$\bar{Z}$ ZI, 6.358 -

s 12. Lastly ZI and ZA being as 3 to 5 *fere*; therefore

$\bar{Z}$ ZA	1,00000,00000
ZI	0,80330,57488
	0,19669,42512
	5

0,98347



0,98347,12560  
8

0,12293,39070

1,00000,00000

0,87706,60930    3 ZF, 7535 -

§ 13. With what hath been here said, if the Reader please to be satisfied at present; I shall, when, if ever, I have (God mercifully assisting) laboured through my tedious Troubles and Distractions, endeavour his better compensation with an entire and particular Tract, according to this new Theory. (And hence too shall shew how Astrologers may deduce their Aspects; with more, I presume, of satisfaction, than from any other hitherto discovered to them. And perhaps with somewhat else more worthy the Reader's paines, and mine.) If not; I here further present him the two following Divisions of a Chord, and will so leave him to seek it there, or where else he pleaseth.

§ 14. The One (approved by many Excellent Mathematicians; See *Mersennus Lib. 1. de Instrumentis Harmonicis, Prop. 15.*) is the Division of ZA, Fig. 3, An. 8, first into two equall parts at N; and then of NA into twelve equall Semitones, by eleven *Meane Proportionalls*, according to this Table following.



In Species,		Numbers Surde,
ZN	$E = \Delta. ZN.$	5.000
ZM	$\sqrt{12} AEcccq.$	$\sqrt{cccc} 488281250.0000000000,000$ $000000000,000000000000$
ZL	$\sqrt{6} AEcq.$	$\sqrt{cc} 3125000000,000000,000000$
ZK	$\sqrt{4} AEc.$	$\sqrt{qq} 1250.0000,0000,0000$
ZI	$\sqrt{3} AEq.$	$\sqrt{c} 250.000,000,000$
ZH	$\sqrt{12} AcqEcq.$	$\sqrt{cccc} 7812500000.0000000000,000$ $000000000,000000000000$
ZG	$\sqrt{AE}.$	$\sqrt{50.00} 00,00$
ZF	$\sqrt{12} AcqqEcq.$	$\sqrt{cccc} 31250000000.0000000000,00$ $0000000000,000000000000$
ZE	$\sqrt{3} AqE.$	$\sqrt{c} 500.000,000,000$
ZD	$\sqrt{4} AcE.$	$\sqrt{qq} 5000.0000,0000,0000$
ZC	$\sqrt{6} AcqE.$	$\sqrt{cc} 500000.000000,000000,000000$
ZB	$\sqrt{12} AcccqE.$	$\sqrt{cccc} 500000000000.000000000000,0$ $00000000000,000000000000$
ZA	$A = \nabla. ZA.$	10.000

Logarithmes,		Numb. D.
ZN	0, 69897, 00043.	5'000
ZM	0, 72405, 58372.3	5'297+
ZL	0, 74914, 16702.2	5'612+
ZK	0, 77422, 75032.1	5'946+
ZI	0, 79931, 33362.	6'300-
ZH	0, 82439, 91691.3	6'674+
ZG	0, 84948, 50021.2	7'07+
ZF	0, 87457, 08351.1	7'492-
ZE	0, 89965, 66681.	7'937+
ZD	0, 92474, 25010.3	8'409-
ZC	0, 94982, 83340.2	8'909-
ZB	0, 97491, 41670.1	9'439-
ZA	1, 00000, 00000.	10'000



§ 15. The other is the Division of ZA, Fig. 4, An. 8, Harmonically at Q: and of QA into 15 equall Semitones.

The manner thus

$$ZA = B$$

$$ZQ = A$$

Therefore  $QA = B - A$

$$A.B :: B - 2A.A.$$

$$B = 10.$$

$$Aq = Bq - 2BA$$

$$Bq = 100.$$

$$Bq = Aq + 2BA$$

$$2Bq = 200.$$

$$2Bq = Aq + 2BA + Bq \quad \sqrt{2Bq} = 14.1421+$$

$$\sqrt{2B} = A + B$$

$$A = 4.1421+$$

$$\sqrt{2Bq} - B = A$$

$$B - A = 5.8579-$$

$$B = 10.000 \quad \sum 1,00000,00.$$

$$A = 4.142+ \quad \sum 0.61722,48.$$

$$X \quad 0,38277,52.$$

$$\square \quad 15.$$

$$\square \quad 0,02551,837 = R \quad 1.061-$$

$$\sum A \quad 0,61722,48. = ZQ \quad 4.142+$$

$$\square + ZQ \quad 0,64274,31.7 \quad ZP \quad 4.393-$$

$$ZP \quad 0,66826,14.14 \quad ZO \quad 4.659-$$

$$ZO \quad 0,69377,98.6 \quad ZN \quad 4.941-$$

$$ZN \quad 0,71929,81.13 \quad ZM \quad 5.240-$$

$$ZM \quad 0,74481,65.5 \quad ZL \quad 5.557-$$

$$ZL \quad 0,77033,48.12 \quad ZK \quad 5.893-$$

$$ZK \quad 0,79585,32.4 \quad ZI \quad 6.250-$$

$$ZI \quad 0,82137,15.11 \quad ZH \quad 6.628-$$

$$ZH \quad 0,84688,99.3 \quad ZG \quad 7.029-$$

$$ZG \quad 0,87240,82.10 \quad ZF \quad 7.454+$$

$$ZF \quad 0,89792,66.2 \quad ZE \quad 7.905+$$

$$ZE \quad 0,92344,49.9 \quad ZD \quad 8.384-$$

M 3

$\square + ZD$



$\begin{array}{l} \text{ZD } 0,94896,33.1 \\ \text{ZC } 0,97448,16.8 \\ \text{ZB } 1,00000,00. \end{array}$ 
 $\begin{array}{l} \text{ZC } 8.891 + \\ \text{ZB } 9.429 + \\ \text{ZA } 10.000 \end{array}$

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s 16. And lastly, that the *Reader* may, with the lesse trouble, compare these severall *Divisions* each with o-ther; I have both reduced our *Authours* Numbers to these, and these to his. See Fig. 1, 2, 3, and 4. An. 8.

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*F I N I S.*

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# These Errors

# Amend thus.

P.	L.		
3	16	[5]	[5]
7	24	} Consonancies	Consonances
	25		
	26		
8	6		
11	25	} Hexachordon minus,	Hexachordon minus,
	26		
12	1	} Eight	Eight
	24		
17	2	} Diapasson	Diapason
19	13		
18	30	} an Eighth [26].	[26] an Eighth [26].
21	1		
22	6	} o Fi dne	a Fifth, and
23	6		
	7	} defumed	defumed
25	10		
34	8	} For Example,	than, for Example, betweene
44	13		
	30	} than betweene	Musicians
53	19		
54	30	} Musicians	Musicians
55	3		
65	23	} observed, that a voyce [65] doth	observed [65], that a voice doth
	23		
69	18	} Synco. p	Synco. p
71	2		
	14	} a Eighth,	an Eighth.
73	2		
74	16	} a Unison.	an Unison.
75	6		
	23	} $\nabla$	$\nabla$
	23		
69	18	} $\triangle$	$\triangle$
71	2		
	14	} Eighths	Eighths
73	2		
74	16	} Eight	Eight.
75	6		
	19	} Former Tract,	Superior Tractate,
78	7		
84	8	} Fig. 10	Fig. p. 10.
85	3		
	13	} 13; and those three then subdivided,	10; and those three then subdivided,
	28		
	28	} as p. 28;	as p. 27.
	28		
	7	} $\frac{5}{3}$	$\frac{5}{3}$
	7		
	8	} A to A, B to B,	A to A, B to B,
	8		
	3	} Chap.	Cap.
	3		







